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Nichols, Henry Wyman

Title:
A method of determining costs in a cotton mill

Place:
New Bedford

Date:
1915

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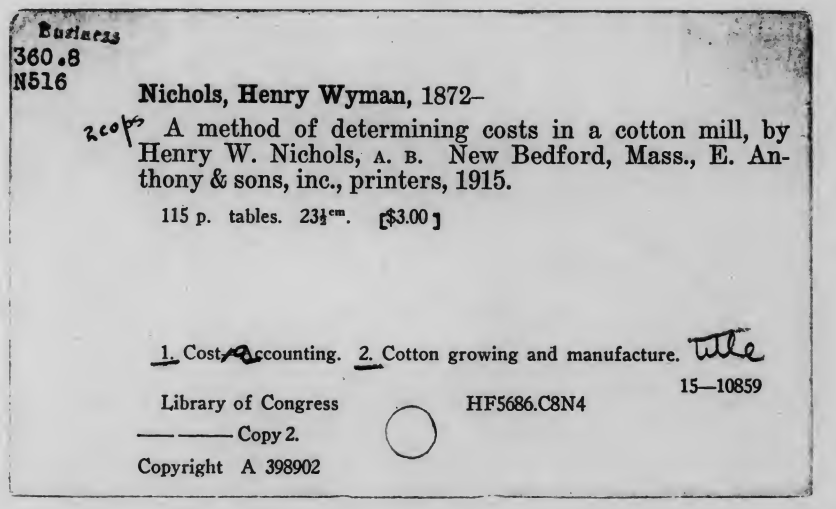

Business
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Nichols, Henry Wyman, 1872–

2 copies A method of determining costs in a cotton mill, by Henry W. Nichols, A. B. New Bedford, Mass., E. Anthony & sons, inc., printers, 1915.

115 p. tables. 23½cm. [$3.00]

1. Cost accounting. 2. Cotton growing and manufacture. Title

15—10859

Library of Congress HF5686.C8N4

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A METHOD OF DETERMINING COSTS IN A COTTON MILL

H. W. NICHOLS

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A METHOD OF DETERMINING COSTS IN A COTTON MILL

By HENRY W. NICHOLS, A. B.

NEW BEDFORD, MASS.
E. ANTHONY & SONS, Inc., PRINTERS
1915

20-52467

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PREFACE

That there has been felt for some time the need of a work describing an accurate method of determining costs in a cotton mill, is very evident to anyone in touch with the textile field. It is a subject concerning which there is much misapprehension, the term cost finding being applied, in some cases, to the methods adopted when seeking a figure to use as a quotation on a new fabric the mill has been asked to quote upon. It is evidently not realized, in a case of this kind, that such a figure can be but an estimate, the person, no doubt, thinking that by some subtile means the mill can determine the cost to a nicety, regardless of the costs of any previously manufactured goods. Nothing could be further from the facts in the case. If a mill is to figure on a fabric that it has not previously manufactured, it must, of necessity, base its quotation on costs previously determined, although such costs may be for goods differing in construction from the ones on which it is to estimate. Such quotations must, in the nature of the case, be estimates only, and their degree of accuracy is in direct proportion to the accuracy with which the costs of goods previously manufactured have been determined.

The need, therefore, of an accurate method of determining costs is readily apparent, since not only are the cost figures of vital interest when considering goods already manufactured, but they become of equal, if not more, importance when using them on which to base quotations for new fabrics; if these previous costs are not correct, one cannot expect the new figures to be accurate. Indeed, one does not make too strong a statement by saying that a good method of ascertaining the cost of the manufactured product, is the best foundation on which to build the efficiency and economy of a mill.

It is well to consider here what this term "Good method" embraces, when applied to the cost figures of a cotton mill.

There can be no argument with the statement that a method, to be of any value, must first of all be accurate, although there may be considerable difference of opinion as to the methods to be adopted to obtain this accuracy, and also as to the degree of accuracy desired.

However, it would appear that a method of cost finding, to be accurate, should contain one main feature; namely, that all the cost of any one article shall fall on that article alone. This result, manifestly, cannot be obtained by any system of averages, no matter how ingeniously devised and carried out. Averages are simply what their name implies, no more, no less; and they cannot, under the best of conditions, give accurate information concerning any separate fabric, but can only treat the product as a whole. The writer was much interested in hearing described, some time ago, the method adopted in determining costs in a large department store: how the concern is divided into its separate departments and how each department, although it may be no more than a glove counter, or a handkerchief counter, is considered as a store in itself and has charged to it the proper amounts for rental, advertising, heating, lighting, and so on.

It may be a far cry from a department store to a cotton mill, and yet there is this analogy: a cost system in a cotton mill, to be accurate, should treat each style of goods being made, exactly as a department store treats its separate departments; and there should be fastened to each distinct style its proper amount of all manufacturing expense, no matter whether this expense be for labor, raw material, or any one of the numerous other items incidental to manufacturing.

In the second place, a cost system, to be of use, must not only be accurate but must also be so devised that it will be readily adaptable to the mill in which it is to be used. A manufacturing concern would not, ordinarily, consider a comparatively small additional outlay, if by so doing it could obtain accurately the manufacturing cost of each of its different products.

On the other hand, if to obtain this information means radical changes in its methods of operation, with consequent friction in its various departments and loss in production, the mill would naturally be very much inclined to consider that the benefits to be derived from knowing accurately the costs would hardly compensate them for the interference with their organization. For this reason, any method of cost accounting, to be of value to a cotton mill, should be handled from the office end almost entirely. There are methods under which considerable of the work falls upon the heads of the different manufacturing departments, but such work cannot rightly be considered a part of the duties of a department head. The two prime requisites of the manufacturing end are keeping up the production and keeping down the expense. Anything that tends to interfere with these two aims must be looked at askance.

In dealing with this subject of cost finding, the writer has endeavored to keep within the limits demanded by the above-mentioned requirements. To some, the methods advocated may seem tedious and involved; but in any such case it should be understood that a description, to be of value, must deal with the subject in considerable detail, and that the actual putting into practice of the method described is frequently a much shorter operation than would appear possible from reading a description of the same. A system such as here described, can be readily handled in a mill of average size by one person devoting only a portion of his time to it, and certainly the results would justify any such outlay.

The method of cost finding, illustrated in this work, must not be taken to fit all cases. No one method can do this, since conditions vary greatly with different mills. It has been the aim to illustrate the essential principles underlying an accurate cost system, and it is left to the reader to apply them in the manner most suitable to his own case. It cannot be too strongly advised that those having charge of such work have a good general knowledge of all departments of the mill, since only in such case can one intelligently size up the different situations constantly arising in a mill today, any one of which may alter the details of the work.

In this connection it is not out of place to state that the young men being turned out by the textile schools of the country are peculiarly adapted to such work. They are as a rule men of a good general education, and, having completed a course in a textile school, they are able to grasp the aim of such work and adapt it to the different conditions they meet with.

The figures dealt with in this book are based on the production for one week of fifty-four hours and not for a quarter, as would be the case in actual practice. For the purpose of illustration, this answers all requirements equally well, and at the same time gives the production and pay for a period more readily grasped by the reader.

While these figures for production and pay are of minor importance, the chief aim being to describe a cost system, yet the writer has endeavored, in all cases, to keep within the bounds prescribed by good mill practice.

HENRY W. NICHOLS.

New Bedford, Massachusetts, 1915.

A Method of Determining Costs in a Cotton Mill

INTRODUCTORY

In establishing a method of cost finding in a cotton mill, it is first essential to divide the different departments, and also the different operations in each department, into what may be termed units, each separate unit to embrace only those machines that perform similar functions and through which the stock passes in practically the same manner.

Thus, all the machinery directly connected with the picking operation may be considered as a unit by itself. The same is true of the carding, also of the drawing, and so on, since in each of these cases the conditions of pay and running are practically the same. To cite an opposite case, in a mill operating both plain and fancy looms, it would not be correct to consider all the weaving as one unit since the conditions are not the same on both kinds of looms; a fixer does not have as many looms in his section if he is on fancies as is the case if he is on plain work; a fancy loom requires more supplies than a plain loom; and many other conditions will be found to vary in different mills. Consequently, in such cases, the plain looms must be considered as one unit by themselves, while the fancy looms should be considered another and distinct unit.

These different units will, of course, be found to vary with different mills, since mills differ widely in their organizations; consequently, no list can be given that will cover all circumstances. In case the reader has occasion at any time to make such a division of a mill, the only advice that can be

given is what has been stated above with, perhaps, the additional advice that in case of any serious doubt as to whether a certain portion of the mill should be made a separate unit or incorporated with some other unit, then the safe method to follow is to make of that portion a distinct unit, since this cannot in any way effect the accuracy of the figures. After the different units into which the mill is to be divided have been determined, there must be obtained several items, these items being as follows:

a—Floor space occupied by each unit.
b—Cost of floor space occupied by each unit.
c—Value of machinery in each unit.
d—Power required to drive the machinery in each unit.

Item *b* should include not only the cost of the construction of that part of the building occupied by the unit, but also the installation of all apparatus that may rightfully be considered as a part of the building. These are the heating, lighting, fire protection and humidifying.

Item *c* should include not only the cost of the bare machinery in the unit, but also such other items as the cost of erecting, cost of shafting and transmission, supplies for starting: in short, everything necessary to put the machinery into running order.

In case an accurate cost system is established at the time the mill is built, it is a simple matter to divide the cost of construction and machinery in such a way that the cost of any particular unit will fall upon that unit. Should, however, such a cost system be started some years after the mill is built, then it is a much more difficult problem and, in the case of many items, estimates only can be obtained. It is, nevertheless, absolutely necessary that the mill be split into its several units and the several items obtained for each unit in as correct a manner as possible, if accurate cost figures for manufacturing are to be obtained.

The mill that will serve to illustrate the methods to be described in this work, is a suppositional cloth mill of approximately 67,000 spindles, running on both carded and combed

Unit	Floor Space	%	Cost of Floor Space	%	Cost of Machinery	%	H. P.	%
Office	5000	1.78	10000.00	3.00				
Picking	5198	1.85	5156.41	1.55	12371.75	1.24	80	3.41
Carding	10824	3.85	10607.52	3.19	56580.27	6.96	98	4.17
Combing	7538	2.69	7387.24	2.21	49060.00	6.04	32	1.36
Drawing	2328	.83	2281.44	.68	7288.50	.90	15	.64
Slubbing	1600	.57	1568.00	.47	5111.52	.63	10	.43
First Int.	2100	.75	2058.00	.62	9509.72	1.17	15	.64
Second Int.	4284	1.52	4198.32	1.26	31211.52	3.84	50	2.13
Jacks	17160	6.10	16816.80	5.05	86088.74	10.59	180	7.66
Warp Spinning	38200	13.58	37436.00	11.24	108845.96	13.51	740	31.50
Filling Spinning	34600	12.30	33908.00	10.20	98847.00	12.16	520	22.12
Spooling	5200	1.85	5096.00	1.53	4923.00	.61	8	.34
Twisting	6336	2.25	6209.28	1.86	17820.00	2.19	90	3.83
Warping	5376	1.91	5268.48	1.58	6090.20	.75	5	.21
Slashing	4158	1.48	4074.84	1.22	4870.00	.60	6	.25
Drawing-in	2680	.95	2626.40	.79	396.87	.05		
Plain Weaving	51860	18.44	84272.50	25.30	120245.68	14.79	250	10.65
Fancy Weaving	37224	13.24	60489.00	18.16	91406.80	11.24	230	9.80
Cloth Room	3600	1.66	3528.00	1.06	4190.00	.52	10	.43
Machine Shop	2585	.92	2533.30	.76	5000.00	.62	10	.43
Power	9460	3.36	18920.00	5.68	94228.00	11.59		
Storage	24000	8.50	8640.00	2.59				
Total	281311	100.	333075.53	100.	814085.53	100.	2349	100.

NOTE: The dollar sign is not used in this work. In all figures representing dollars and cents, the decimal point comes between the dollars and cents.

work and selling its cloth in the grey. The units into which this mill has been divided are shown on page 9, while on the same line with each unit is shown the floor space; cost of floor space; cost of machinery, if any; also amount of H. P. required to drive the machinery, if any.

There will also be noted a per cent. column attached to each item. This shows what per cent. each item bears to the total of its own column. For instance, take the column having the heading "Floor space"; the total of this column is 281,311, which is the number of square feet occupied by all the units. The office occupies 5,000 sq. ft.; then 5,000÷281,311 gives the percentage that the floor space of the office bears to the total floor space, or 1.78%, which number is found under the per cent. column next to the floor space, and on the same line with "office".

Part I

LABOR COSTS

Card Room

Having split the mill into its different units and attached to each unit the necessary items, we are prepared to take up the reports from the various departments, both as regards production and pay.

In this connection, it is important to note that all reports, with which the person figuring costs has to deal, should be so made up that the different items required may be readily drawn off, and by this means eliminate any needless labor. It is also essential that the person having this work in charge should have a good working knowledge of the organization of his mill, and thus be able to analyze any changing conditions that may arise.

The layout of the work in the card room is shown on the following page, and since it is necessary to have a thorough understanding of this layout in order to comprehend the divisions that will be made when determining the costs, a brief description is given.

There are eight different numbers of hank roving being made on the jacks—8, 10, 12, 14, 16, 18, 20 and 25. This does not, however, exhaust the divisions that should be made, since some of the same numbers are being spun from different stock; while in one case, that of the 10 hk., not only is it made from different stock, but also some of it is carded and some of it combed.

These different conditions must be taken into consideration, and each division contain only that hank that is made from the same stock, run through the same machines, and

Weights

Stock.	Picker.	Cards.	Combers	Drawing.	Slubbers.	1st. Int.	2d. Int.	Jacks.
			Carded Work					
1⅛	12 oz.	50 grs.		60 grs.	.60 hk.	1.04 hk.	2.6 hk.	8 hk.
1¼	12 oz.	50 grs.		60 grs.	.60 hk.	1.35 hk.	3.5 hk.	10 hk.
			Combed Work					
1¼	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.35 hk.	3.5 hk.	10 hk.
1¼	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.35 hk.	3.5 hk.	12 hk.
1¼ E.	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.35 hk.	3.5 hk.	10 hk.
1¼ E.	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	4.95 hk.	14 hk.
1⅜	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	4.95 hk.	14 hk.
1⅜	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	4.95 hk.	16 hk.
1⅜	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	5.25 hk.	18 hk.
1⅜	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	5.25 hk.	20 hk.
1⅜ s. i.	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	5.25 hk.	18 hk.
1½ s. i.	12 oz.	50 grs.	55 grs.	60 grs.	.60 hk.	1.65 hk.	5.25 hk.	20 hk.
1½ s. i.	10 oz.	40 grs.	50 grs.	55 grs.	.70 hk.	2 hk.	6.6 hk.	25 hk.
1⅞ E	10 oz.	40 grs.	50 grs.	55 grs.	.70 hk.	2 hk.	6.6 hk.	25 hk.

that has the same weight on each machine. Thus, in the layout there are fourteen different hank rovings listed, no two of which are run under exactly the same conditions, although in several instances the same number of hank roving is being turned out at the jacks.

In any production report from the card room, that is to be used when determining costs, the production of each of these different hank rovings must be listed separately, no two being combined.

It is not, however, necessary, when making out the pay roll, to make the divisions shown in the layout, since all the 10 hanks, for instance, may be grouped when indicating the

amount of pay; providing, however, that the piece-work price is the same in each case.

The production sheet of the card room shows the following, this production being for one week, and showing what is produced at the jacks:

Stock.	Hank.	Pounds Run.
	Carded Work	
1⅛	8	3107
1¼	10	4092
	Combed Work	
1¼	10	2051
1¼	12	6295
1¼ E	10	2547
1¼ E	14	255
1⅜	14	1374
1⅜	16	2857
1⅜	18	1230
1⅜	20	235
1⅜ s.i.	18	1066
1½ s.i.	20	101
1½ s.i.	25	1494
1⅞ E	25	785

Using the production report, together with the layout of the card room, the figures should be assembled in such a way that the production of any weight or hank, at any one of the units, may be readily determined. These production figures will, of course, show the production turned out at the jacks and not at the machine for which the figures may be given. There is no practical method of determining accurately the number of pounds any one machine in the card room may be turning out, and this is not necessary, as the pounds produced

at the last process or, in this case, the jacks, answers all purposes.

Such a sheet is shown on page 15. Referring to this page, the production of any one of the weights, at any machine, is readily seen. For instance, on the cards, 25,210 lbs. of the roving produced at the jacks was run through the cards as 50 gr. sliver, while 2,279 lbs. was 40 gr. sliver. These divisions are used constantly in later figures, and will be referred to frequently.

The pay roll is given on pages 16 and 17. This is divided into day work and piece work; also, the portion dealing with the day work is so arranged that the total for any one unit may be readily drawn off. For instance, the total for general expense is 79.27; for picking, it is 30.76; and so on. Having this sheet arranged in this manner facilitates the work of the one who is to use these figures and who must obtain them from the pay roll.

There has now been given sufficient information with which to determine the labor cost at any unit in the card room. It may be stated here that the term labor cost embraces all expense for labor that comes in direct contact with the product as it passes through the different manufacturing processes.

Cost, per lb., at pickers:—If all the cotton should be passed through the pickers at practically the same rate of production, the labor cost, per pound, could readily be determined by dividing the total labor pay on pickers by the pounds produced (the pounds produced referring, in all cases, to the pounds turned out at the jacks).

Should, however, there be a different rate of production on the different kinds of cotton being run, it would not be correct to say that all the cotton is costing the same per lb. to run. The picking cost, however, is so small that results would hardly justify one in making a separation, unless, indeed, the circumstances should be exceptional.

In order, however, to illustrate all cases, wherever there is any difference in the theoretical production of any one unit, it will be assumed that a separation is to be made.

HANK ROVING AND STOCK	1⅛ 8hk	1¼ 10hk K	1¼ 10hk C	1¼ E 10hk	1¼ 12hk	1¼ E 14hk	1⅜ 14hk	1⅜ 16hk	1⅜ 18hk	1⅜ s.i. 18hk	1⅜ 20hk	1½ s.i. 20hk	1½ s.i. 25hk	1 7/16 E 25hk	Total
Picker															
12 oz..	3107	4092	2051	2547	6295	255	1374	2857	1230	1066	235	101			25210
10 oz..													1494	785	2279
Cards															
50 grs.	3107	4092	2051	2547	6295	255	1374	2857	1230	1066	235	101			25210
40 grs.													1494	785	2279
Combers															
55 grs.			2051	2547	6295	255	1374	2857	1230	1066	235	101			18011
50 grs.													1494	785	2279
Drawing															
60 grs.	3107	4092	2051	2547	6295	255	1374	2857	1230	1066	235	101			25210
55 grs.													1494	785	2279
Slubbers															
.60 hk.	3107	4092	2051	2547	6295	255	1374	2857	1230	1066	235	101			25210
.70 hk.													1494	785	2279
1st Int.															
1.04 hk	3107														3107
1.35 hk		4092	2051	2547	6295										14985
1.65 hk						255	1374	2857	1230	1066	235	101			7118
2 hk...													1494	785	2279
2d Int.															
2.6 hk	3107														3107
3.5 hk		4092	2051	2547	6295										14985
4.95 hk						255	1374	2857							4486
5.25 hk									1230	1066	235	101			2632
6.6 hk													1494	785	2279

Card Room Pay Roll — Day Work

Position	Hrs.	Rate	Amount	Total
Overseer	54	.6666	36.00	
Second hand	54	.3171	17.12	
Elevator man	54	.1412	7.62	
Scrubber	54	.1178	6.36	
Sweeper	54	.0855	4.62	
Waste man	54	.1398	7.55	79.27
Boss picker	54	.1846	9.97	
3 Picker tenders	162	.1283	20.79	30.76
Boss grinder	54	.2460	13.28	
Ass't grinder	54	.1733	9.36	
4 Strippers	216	.1475	31.86	54.50
Doubler tender	54	.1398	7.55	
2 Ribbon tenders	108	.1398	15.10	
Boss comber	54	.3171	17.12	
3d Hand combers	54	.1927	10.41	
5 Comber tenders	270	.1691	45.65	95.83
3 Drawing tenders	162	.1347	21.82	21.82
3d Hand slubbers	54	.1927	10.41	
2 Back tenders—1st int.	108	.0962	10.39	
3d Hand roving frames	54	.2343	12.65	
2 Roving men	108	.1347	14.55	
2 Speeder oilers	108	.1347	14.55	62.55
				344.73

Card Room Pay Roll — Piece Work

Hank Roving.	Amount.
.60	20.98
.70	2.23
1.04	1.83
1.35	15.40
1.65	9.37
2.00	3.62
2.6	5.30
3.5	34.73
4.95	17.63
5.25	10.96
6.6	12.22
8.	14.42
10.	53.43
12.	48.34
14.	15.85
16.	33.83
18.	32.24
20.	6.02
25.	53.30
Total piece work,	391.70
Total day work,	344.73
Total card-room pay roll,	736.43

In the case of the mill being used as an illustration, the theoretical weekly production of a picker on 10 oz. laps is taken at 8,640 lbs., and on 12 oz. laps, at 10,260 lbs.

The labor cost on the pickers is 30.76, and it is necessary to split this amount between the two different weights being run. Since the more pounds the picker turns off in a given time, the smaller is the cost per pound, the reciprocal of the numbers, showing the theoretical production, must be used when obtaining the percentage that the cost of each bears to the whole.

100 is divided by each of the numbers representing the theoretical production, and each result multiplied by its own pounds run. The percentage that any one of these latter results bears to the sum of the results, gives the percentage of the labor cost chargeable to its production. This is more fully illustrated in the following figures, which give the labor cost per lb. on picking.

100÷8640 (theoretical production on 10 oz. laps)=.01157
.01157×2279 (lbs. run)=26.36
100÷10260 (theoretical production on 12 oz. laps)=.00974
.00974×25210 (lbs. run)=245.54
26.36+245.54=271.90
26.36÷271.90=.097 or 9.7% to be charged to 10 oz. work.
245.54÷271.90=.903 or 90.3% to be charged to 12 oz. work.
9.7% of 30.76 (labor cost)=2.98
90.3% of 30.76=27.78
2.98 (cost)÷2279 (lbs. run)=.001308 labor cost per lb. for picking on 10 oz. work.
27.78 (cost)÷25210 (lbs. run)=.001102 labor cost per lb. for picking on 12 oz. work.

Cost, per lb., at cards:—In the carding, also, the theoretical production varies with the different stocks run, and what was stated under picking cost in regard to taking this point into consideration, applies equally well here. In figuring the cost on the cards the theoretical production will be considered, and dealt with in exactly the same manner as with the pickers, giving, however, no explanations of the mathematical work. The theoretical production on the cards, for the various weights being run, was taken as follows:

Grains	1⅛	Carded 1¼	Combed 1¼	1¼ E	1⅜	1⅜ s.i.	1½ s.i.	1½ s.i.	1⁷⁄₁₆ E
50	500	450	470	475	390	365	310		
40								256	378

The pounds run of each group are obtained from the sheet shown on page 15, while the following figures, which show the cost per lb. of each, are carried through in exactly the same manner as was done under picking.

	Theo. Prod.		lbs. run		%	Total Cost	Proportional Cost	lbs.	Cost per. lb.
100÷	256=	.391×	1494=	584.15=	.09×	54.50=	4.91÷	1494=	.003286
100÷	378=	.264×	785=	205.24=	.032×	"	1.74÷	785=	.002216
100÷	500=	.2 ×	3107=	621.40=	.096×	"	5.23÷	3107=	.001683
100÷	450=	.222×	4092=	908.42=	.14×	"	7.63÷	4092=	.001864
100÷	470=	.213×	8346=	1777.70=	.275×	"	14.99÷	8346=	.001795
100÷	475=	.21 ×	2802=	588.42=	.091×	"	4.96÷	2802=	.001770
100÷	390=	.256×	5696=	1458.28=	.225×	"	12.26÷	5696=	.002152
100÷	365=	.274×	1066=	292.08=	.0451×	"	2.46÷	1066=	.002307
100÷	310=	.322×	101=	32.52=	.0051×	"	.48÷	101=	.002772

Cost, per lb., at combers:—The combing unit presents another instance where the theoretical production may be employed if thought best; otherwise the cost per lb. is obtained by dividing the total amount paid for combing, by the pounds run. In this case the theoretical production will be considered, this production being taken as follows:

Grs.	1¼	1¼ E	1⅜	1⅜ s.i.	1½ s.i.	1½ s.i.	1⁷⁄₁₆E
55	800	800	800	700	700		
50						650	800

Referring to the table shown on page 15 to obtain the number of pounds run, in each of the above groups, also taking from the pay roll the amount expended for combing, the following figures are obtained:

	Theo. Prod.		lbs. run		%	Total Cost	Proportional Cost	lbs.	Cost per lb.
100+	650=	.154×	1494=	230.08=	.0884×	95.83=	8.47+	1494=	.005670
100+	800=	.125×	785=	98.13=					
100+	800=	.125×	8346=	1043.25=					
100+	800=	.125×	2802=	350.25=	.8474×	95.83=	81.20+	17629=	.004606
100+	800=	.125×	5696=	712.00=					
100+	700=	.143×	1066=	152.44=					
100+	700=	.143×	101=	14.44=	.0642×	95.83=	6.15+	1167=	.005270

Cost, per lb., at draw frames:—The drawing cost is so small that, even with some of the work on two process and some on three, one would hardly be justified in making any division. None will be made here, the cost on the draw frames simply being divided by the pounds run in order to obtain the cost per lb.

21.82 (cost on draw frames)÷27,489 (lbs. run)=.000794, cost per lb.

Cost, per lb., at roving frames:—Under this heading there is met, for the first time, labor that divides itself into two groups, due to the methods of payment. First, there are the operatives who run the machines and are paid by the piece or, in other words, according to the amount of work turned off; there are also those operatives whose work brings them in contact with the different frames and who are paid by the day; these are the oilers, roving men, doffers and so on. Considering first those operatives who are on piece work; each operative deals directly with a particular hank roving and it is a simple matter to determine the cost per lb. of each hank on this work, provided the production reports show the pounds run on each hank and the pay roll shows the amount paid for piece work on each hank, both of which points should be provided for.

Taking up first the .60 hk. roving on the slubbers; the pay roll shows a total of 20.98 expended for piece work on this count, and the production report shows a total of 25,210 lbs. run on this count, then

20.98÷25,210=.000832, cost per lb. of piece work on .60 hk.

Taking each hank by itself, on all roving frames, and treating as above, the following is obtained:

Hank.	Pay.	Pounds Run.	Cost per lb.
.60	20.98	25,210	.000832
.70	2.23	2,279	.000978
1.04	1.83	3,107	.000589
1.35	15.40	14,985	.001028
1.65	9.37	7,118	.001316
2.00	3.62	2,279	.001588
2.6	5.30	3,107	.001706
3.5	34.73	14,985	.002318
4.95	17.63	4,486	.003930
5.25	10.96	2,632	.004164
6.6	12.22	2,279	.005362
8.	14.42	3,107	.004641
10.	53.43	8,690	.006148
12.	48.34	6,295	.007679
14.	15.85	1,629	.009729
16.	33.83	2,857	.011841
18.	32.24	2,296	.014042
20.	6.02	336	.017917
25.	53.30	2,279	.023387

Apportioning day labor on roving frames:—There are three methods generally adopted when splitting the cost of day labor on the roving frames, (*a*) according to the number of spindles, or frames, on each hank (the term hank here indicating the final hank roving produced by the last roving process), (*b*) according to the production on each hank, and (*c*) according to the total piece work cost of each hank on the roving frames.

No one of these methods can be said to fit perfectly all cases of day labor. Take, for instance, the oilers and doffers. In the case of the oilers, the number required depends directly upon the number of frames or spindles being run, and the cost of this labor may be correctly apportioned on this basis. In the case of the doffers, however, this is not true, since a frame on a fine hank does not require as much attention from this class of labor as does a frame on a coarser hank. The cost of this labor would be more correctly apportioned if based on the pounds produced. To work out each class of day labor according to a different percentage basis would entail labor hardly justified by the results that would be obtained. The difference in any case would be very slight. It remains, therefore, to select that one of the three methods that best fits the varying conditions. The spindle basis, also the production basis, have been touched upon and there remains the cost basis. If the total pounds produced of each different hank on the jacks, is multiplied by the total piece work cost per lb. on all roving frames, of that hank, and these results used as a percentage basis on which to apportion the day labor cost, then both the number of spindles and the pounds run will have an influence on the result, since the number of spindles it takes to turn out a given production, in a given time, governs the piece work cost per lb., while the pounds produced are directly used. Taking into consideration all the conditions that are to be met, there is no better single method of apportioning the day labor cost on the roving frames than by the cost method.

Instead, however, of finding the total piece work cost of each of the different hanks being made on the jacks, as mentioned above, the same results are obtained, and with much less work, by finding what per cent. the cost of day work bears to the piece work cost, and then adding that per cent. to the piece work cost per lb. on each hank.

First find the total cost per lb. of all piece work on all the roving frames, for each of the different hanks being made on the jacks. The following table shows this, the piece work cost per lb. given for the different frames being those previously obtained:

Machine.	8 hk.	10 hk.	12 hk.	14 hk.	16 hk.	18 hk.	20 hk.	25 hk.
Slubber.	.000832	.000832	.000832	.000832	.000832	.000832	.000832	.000978
1st Int.	.000589	.001028	.001028	.001316	.001316	.001316	.001316	.001588
2nd Int.	.001706	.002318	.002318	.003930	.003930	.004164	.004164	.005362
Jack.	.004641	.006148	.007679	.009729	.011841	.014042	.017917	.023387
Total for piece work	.007768	.010326	.011857	.015807	.017919	.020354	.024229	.031315

The day work cost on roving frames, as shown by the pay roll, is 62.55, while the total cost of piece work on the roving frames, also shown on the pay roll, is 391.70. Dividing the day pay by the piece work pay gives the percentage that must be added, for day pay, to cost per lb. of piece work on each hank.

62.55÷391.70=.15969 or 16%.

Take the 8 hk., for an illustration, the total piece work cost on roving frames for the 8 hk. is .007768, 16% of .007768 is .001242 which, added to .007768 gives .009010 as the total cost per lb. of all work on the roving frames.

Taking each hank roving produced on the jacks, and treating in the same way the following is obtained:-

	8 hk.	10 hk.	12 hk.	14 hk.	16 hk.	18 hk.	20 hk.	25 hk.
Piece work cost, per lb.	.007768	.010326	.011857	.015807	.017919	.020354	.024229	.031315
16%=	.001242	.001652	.001897	.002529	.002867	.003256	.003876	.005010
Total cost per lb. on rov. frames	.009010	.011978	.013754	.018336	.020786	.023610	.028105	.036325

There remains to be distributed the expense that is general to the whole room, such as the pay for the overseer, second-hand, and so on. As shown by the pay roll this amounts to 79.27. As this labor is general to all the room, it is best distributed on a percentage basis, obtained by dividing this amount by the total of all other costs. This method is the same as the one explained in connection with the distribution of the day labor on the roving frames. Since the cost of the whole room is being used, there must be as many divisions of the hank rovings as are required by the different costs on the various machines.

The total pay roll of the card room amounts to 736.43. Of this amount 79.27 is for the general expense that is to be distributed. Then 736.43—79.27, or 657.16 is the amount of the pay already distributed. Dividing 79.27 by 657.16 gives the per cent. that should be added to the cost per lb., so far obtained, of the different hanks.

79.27÷657.16=.1054 or 10.54%.

The summary of the costs in the card room, together with the addition of the 10.54%, is shown in the following table.

The mathematical accuracy of the figures, up to this point, may be checked, if desired, by multiplying the total

	Carded					
Machine	1⅛ 8 hk.	1¼ 10 hk.	1¼ 10 hk.	1¼ E. 10 hk.	1¼ 12 hk.	1¼ E. 14 hk.
Pickers	.001102	.001102	.001102	.001102	.001102	.001102
Cards	.001683	.001864	.001795	.001770	.001795	.001770
Comber			.004606	.004606	.004606	.004606
Drawing	.000794	.000794	.000794	.000794	.000794	.000794
Roving	.009010	.011978	.011978	.011978	.013754	.018336
Total	.012589	.015738	.020275	.020250	.022051	.026608
10.54% =	.001327	.001659	.002137	.002134	.002324	.002805
Total cost per lb. in card room	.013916	.017397	.022412	.022384	.024375	.029413

cost per pound of each hank, by the pounds produced of that hank, and adding the results thus obtained. This sum should be the same as the total of the card room pay roll, allowing a few cents one way or the other for the incompleteness of the decimals.

If the 8 hk. had been run three process, instead of four, the methods that have been followed would have applied equally well.

In case any of the roving frame tenders are not paid on the piece work basis, then the cost on those frames may be obtained by following the method described under "Spinning Room."

1⅜ 14 hk.	1⅜ 16 hk.	1⅜ 18 hk.	1⅜ s.l. 18 hk.	1⅜ 20 hk.	1½ s.l. 20 hk.	1½ s.l. 25 hk.	1 7/16 E 25 hk.
.001102	.001102	.001102	.001102	.001102	.001102	.001308	.001308
.002152	.002152	.002152	.002307	.002152	.002772	.003286	.002216
.004606	.004606	.004606	.005270	.004606	.005270	.005670	.004606
.000794	.000794	.000794	.000794	.000794	.000794	.000794	.000794
.018336	.020786	.023610	.023610	.028105	.028105	.036325	.036325
.026990	.029440	.032264	.033083	.036759	.038043	.047383	.045249
.002845	.003103	.003401	.003487	.003875	.004010	.004994	.004769
.029835	.032543	.035665	.036570	.040634	.042053	.052377	.050018

Spinning Room

The mill being used as an illustration has ring frames only. As the stock passes from one department of the mill to another, it is absolutely necessary, in order to have a clear understanding of the methods adopted when finding the costs, to have clearly in mind the organization of the mill. By this means only can one attach the costs of one department to the proper product in another department.

The different yarns being spun in the spinning room, also the different rovings and stock used for each yarn, are shown in the following table:

Hank Roving and Stock.	Warp.	Filling.
8 hk.—1⅛ carded	35s	40s
	40s	
10 hk.—1¼ carded	45s	50s
10 hk.—1¼ combed	50s	
10 hk.—1¼ E. combed	45s hard twist	45s
12 hk.—1¼ combed	55s	60s
	60s	
14 hk.—1¼ E. combed	65s hard twist	
14 hk.—1⅜ combed	70s	70s
16 hk.—1⅜ combed	80s	75s
18 hk.—1⅜ combed	90s	
18 hk.—1⅜ s.i. combed		85s
		90s
20 hk.—1⅜ combed		100s
20 hk.—1½ s.i. combed	100s	
25 hk.—1 7/16 E. combed		120s hard twist
25 hk.—1½ s.i. combed	120s	120s
		130s

The production report of the ring spinning room should always show the different counts being run, the number of spindles on each count and the pounds run on each count.

The production sheet is as follows:

Warp			Filling		
Counts.	Spindles.	Pounds.	Counts.	Spindles.	Pounds.
35s	2465	2507	40s	131	118
40s	496	420	45s	2588	1887
45s	1121	817	50s	5142	3193
45s hard twist	1330	609	60s	2560	1221
50s	3237	2010	70s	1376	520
55s	3570	1960	75s	3234	1106
60s	6148	2988	85s	1518	437
65s hard twist	926	250	90s	2330	608
70s	2188	827	100s	1022	230
80s	5374	1693	120s	1105	190
90s	4463	1205	120s hard twist	6111	770
100s	444	100	130s	4745	688
120s	3433	587			
Totals	35195	15973		31862	10968

The pay roll of the spinning room is as follows:

Position.	Amount.
Overseer	33.00
Second-hand	18.00
6 Section hands	69.60
1 Oiler	9.00
2 Roving men	19.00
10 Doffers	64.80
14 Cleaners	87.50
2 Banders	16.00
1 Scrubber	5.80
	322.70

Spinners:—Warp —275 sides @ .0161=239.08
Filling—249 sides @ .0183=246.06
485.14

Cost finding in the spinning room adapts itself to the spindle basis more readily than in any other department of the mill. With practically every division of the help it holds true that the number employed depends directly upon the number of frames, or in other words, the number of spindles, in the room. Thus, the number of section hands, the number of oilers, the number of cleaners and so on, are in all cases determined by the number of spindles. There is, however, an exception to this general rule, namely, the doffers, since the class of work, rather than the number of spindles, may more correctly be said to govern the number employed. To make a distinction in the distribution of the cost of this one item would hardly be justified by the results obtained, and it consequently may be stated that there is no better method of handling the cost in the spinning room than on the spindle basis.

Referring to the pay roll of the spinning room, the price paid the spinners is slightly more on the filling than on the warp, and it is, therefore, necessary to keep these two classes of work separate when finding the cost per spindle. The method adopted may be summarized as follows:

Let A=number of spindles on warp.
B= " " " " filling.
C=cost per spindle of general expense.
D= " " " " spinners on warp.
E= " " " " " " filling.
Then
Total cost of general expense ÷ (A + B)=C.
Total cost of spinners on warp ÷ A=D.
Total cost of spinners on filling ÷ B=E.
C + D=total cost per spindle on warp.
C + E=total cost per spindle on filling.

After having obtained the cost per spindle, the cost per pound of any count of warp, or filling, is obtained by multiplying the total number of spindles run on that count, by the cost per spindle of the warp yarn, if it is a warp yarn being dealt with; or if it is filling, then the cost per spindle of the filling is used. The result thus obtained is divided by the

Warp	35s	40s	45s	45s Hard Twist	50s	55s	60s	65s Hard Twist	70s	80s	90s	100s	120s
Spindles run	2465	496	1121	1330	3237	3570	6148	926	2188	5374	4463	444	3433
Production	2507	420	817	609	2010	1960	2983	250	827	1693	1205	100	587
Cost per. sp	←					.011608							→
Cost per. lb.	.011408	.013702	.015919	.025339	.018686	.021134	.023873	.042977	.030698	.036330	.042974	.051517	.067858

Filling	40s	45s	50s	60s	70s	75s	85s	90s	100s	120s	120s Hard Twist	130s
Spindles run	131	2588	5142	2560	1376	3234	1518	2330	1022	1105	6111	4745
Production	118	1887	3193	1221	520	1106	437	608	230	190	770	638
Cost per. sp.	←					.012532						→
Cost per lb.	.013912	.017187	.020187	.026275	.033162	.036644	.045532	.048025	.055685	.072883	.099458	.086430

pounds run on that count and this result gives the cost per pound of that yarn. Take the case of the mill being used as an illustration, the pay roll shows a total of 322.70 as the cost of the general help; 239.08, cost of spinners on warp, and 246.06, cost of spinners on filling. There are 35,200 spindles on warp yarn and 31,872 spindles on filling yarn, making a total of 67,072 spindles.

Then,

322.70÷67,072=.004811 cost per spindle of general help.
239.08÷35,200=.006792 cost per spindle of warp spinners.
246.06÷31,872=.007721 cost per spindle of filling spinners.
.004811+.006792=.011603 total cost per spindle on warp.
.004811+.007721=.012532 total cost per spindle on filling.

If now, the cost per pound of the 35s warp yarn is to be determined, the equation will be

$$\frac{.011603 \text{ (cost per sp. on warp)} \times 2465 \text{ (spindles run on 35s)}}{2507 \text{ (pounds of 35s warp produced)}}$$

equals .011408, spinning cost per pound of 35s warp. The table on page 29 shows the cost per pound in the spinning room, of the different yarns being run, and in each case the result has been worked out in the above manner.

Warp Preparation Room

The methods of handling the warp yarn, after it leaves the spinning room, varies with different mills. In the case of the mill being used as an illustration, it will be assumed that the processes of spooling, twisting, warping, slashing and drawing-in are included in one department and under one overseer.

The pay roll of this department is shown on page 31.

Before the different sub-divisions of this department can be taken up separately, it is first necessary to split the cost of the general expense and attach to each process its own share of this cost. This is best carried out on the productive labor cost basis.

Position.			Amount.	Total.
Overseer			24.00	
Second-hand			16.00	40.00 general
Third-hand on spoolers			11.00	
One yarn boy on spoolers			8.00	19.00 spoolers only
SPOOLING.				
Count.	Pounds run.	Price per 100 lbs.	Amount.	
35	2507	.48	12.03	
40	420	.50	2.10	
45	1426	.54	7.70	
50	2010	.58	11.66	
55	1960	.60	11.76	
60	2988	.64	19.12	
65	250	.70	1.75	
70	827	.76	6.29	
80	1693	.90	15.24	
90	1205	1.15	13.86	
100	100	1.50	1.50	
120	587	2.00	11.74	114.75—spooling
TWISTERS.				
1 section hand			13.00	
4 twister tenders			43.20	
2 doffers			16.00	
3 tieing-over and cleaning			21.00	
1 band-man and rail washer			10.00	103.20—twisters
WARPERS.				
3 warper tenders			30.75	
3 tieing-in girls			24.75	
1 man changing beams			9.00	64.50—warpers
SLASHERS.				
3 slasher tenders			41.25	
2 helpers			16.50	57.75—slashers
DRAWING- AND TWISTING-IN.			359.90	359.90—drawing- and twisting-in

According to the pay roll, the amount of the general expense is 40.00; the productive labor cost for spooling is 19.00+ 114.75, or 133.75; for twisting it is 103.20; for warping, 64.50; for slashing, 57.75; and for drawing- and twisting-in it is 359.90. The total productive labor cost is 719.10.

The percentage that the productive labor cost, on any one process, bears to the total productive labor cost, gives the percentage of general cost to be charged to that process.

To illustrate, the productive labor cost on spooling is 133.75, the total productive labor cost is 719.10, then 133.75÷ 719.10=.186, or 18.6%. 18.6% of 40.00 (general cost)=7.44, amount of general cost to be charged to the operation of spooling.

This method is adopted in the following table, which splits the general cost between the different sub-divisions:

Process.	Productive Labor Cost.	Percent. of Total.	Amount of General Expense.
Spooling,	133.75	18.6	7.44
Twisting,	64.50	8.97	3.59
Warping,	57.75	8.03	3.21
Slashing,	103.20	14.35	5.74
Drawing- and twisting-in.	359.90	50.05	20.02
Totals,	719.10	100.00	40.00

Cost, per lb., on spooling:—Spooler tenders are usually paid so much a hundred pounds, the price varying with the counts of the yarn. In such cases the cost per pound, so far as the spooler tenders themselves are concerned, is obtained by dividing the pay per hundred pounds by 100.

If the tenders are paid by the day, the best method to adopt is the spindle basis and apply it the same as in the case of the spinning.

It is seen from the pay roll shown on page 31 that in this case the tenders are paid on the piece work plan. There remains, however, to be divided, the general expense on the spoolers. This general expense amounts to 19.00 (section hand and yarn boy) +7.44 (portion of general expense) making a total of 26.44.

This amount should be split between the different counts run, on the productive labor cost basis.

Amount to be apportioned=26.44.

Cost of spooler tenders=114.75.

26.44÷114.75=.230413, or 23.0413%.

If now, 23.0413% of the cost per pound for spooler tenders on any count, be added to the cost per pound for spooler tenders on that count, the result will give the total spooling cost per pound of the count.

To illustrate, the pay for spooling 35s is .48 a hundred pounds, or .0048 per pound (see pay roll).

23.0413% of .0048=.001105.

.0048+.001105=.005905 total labor cost per pound on spooling 35s.

This method is adopted in the following table, which shows the labor cost per pound on spooling:

Count.	Productive Labor Cost, Per Pound.	Productive Labor Cost Per Pound + 23.0413%.
35	.0048	.005905
40	.005	.006152
45	.0054	.006644
50	.0058	.007136
55	.006	.007382
60	.0064	.007874
65	.007	.008612
70	.0076	.009351
80	.009	.011073
90	.0115	.014149
100	.015	.018456
120	.02	.024608

Cost, per pound, on twisting:—The total labor cost on twisting is 103.20 (labor) +5.74 (portion of general expense), which totals 108.94.

In obtaining the cost per pound on twisters the spindle basis is adopted, which is the same as the one explained under spinning. In this connection it is necessary to know the number of spindles run on each count, also the number of pounds of each count produced. The production report should take care of both of these items.

The counts run on the twisters under consideration, the number of spindles on each count, and the pounds produced, are given in the following table:

WARP YARN

Count.	Spindles.	Pounds.
40/2	220	412
65/2	32	35
65/2 hard twist	335	210
80/2	650	574
120/2	2475	1185
	FILLING YARN	
40/2	52	115
120/4 hard twist	1036	753
	Total, 4800	

Dividing the total labor cost on twisters by the total spindles run, gives the cost per spindle.

108.94 (total labor cost)÷4800 (total spindles)=.022695 cost per spindle.

The 40/2 is run on 220 spindles, which turn off 412 pounds, then the number of spindles multiplied by cost per spindle, and this result divided by the pounds produced, will give the cost per pound, or

$$\frac{220 \text{ (spindles on 40/2)} \times .022695 \text{ (cost per spindle)}}{412 \text{ (lbs. produced)}}$$

equals .012118 cost per lb.

The following table gives the cost per pound of each count run on the twisters and is obtained by the above method:

WARP

Count.	Spindles.	Cost per Spindle.	Pounds Run.	Cost per Pound.
40/2	220	.022695	412	.012118
65/2	32	"	35	.020749
65/2 hard twist	335	"	210	.036203
80/2	650	"	574	.025699
120/2	2475	"	1185	.047400
		FILLING		
40/2	52	.022695	115	.010262
120/4 hard twist	1036	"	753	.031224

Cost, per pound, on warping:—In dealing with the warpers, and all later machinery in a cotton mill, an element enters into the work that, so far, has not been encountered; that is, from the time the yarn comes to the warpers it is handled as belonging to a certain style of goods and in dealing with the cost, the style the yarn is going into, and not the count, should be considered. In other words, the cost per pound of warping a certain style should be the end aimed for, and not the cost per pound of warping a certain count of yarn.

It is consequently, essential to know the different styles the mill is making. These are given in the following tables, together with other information that may not exactly be considered pertinent at this point, as it applies more directly to the weaving process. To save duplicating, however, it is included here.

A brief explanation of these tables is not out of place at this point.

Plain Styles

Style.	Width.	Sley.	Pick.	Warp.	Filling.	% Warp.	% Filling.	Weight.	Weaving Price.
A.	39	80	80	35	50	59	41	5.00	.245
B.	33	76	80	55	60	51	49	8.50	.245
C.	30	76	76	60	85	59	41	11.75	.231
D.	30	80	80	90	130	59	41	16.46	.245
E.	30	64	64	50	75	60.2	39.8	12.30	.195
F.	28	68	64	60	75	57.2	42.8	14.10	.195
G.	30	84	80	60	85	60	40	11.00	.245
H.	30	88	80	60	90	62.5	37.5	10.66	.245
J.	32	76	68	80	120	63	37	15.36	.205
K.	27	90	60	60	90	69.5	30.5	13.06	.18
L.	27	94	72	100 50	120	25.3 44.6	30.1	14.52	.22
M.	28	84	80	55	75	59	41	10.31	.245
N.	34	68	108	70	45E	29	71	6.75	.33
P.	34	72	100	70	45E	32	68	6.75	.30
R.	26	96	108	60	22/26 Denier	74	26	14.63	.33

Fancy Styles

Style.	Width.	Sley.	Pick.	Warp.	Filling.	% Warp.	% Filling	Weight	Weaving Price.
F. A.	27	70	70	45	70	61	39	10.96	.376
F. B.	27	104	92	80 40/2 Mer.	100 40/2 Mer.	43 15.8	27.3 13.9	10.31	1.00
F. C.	30	80	70	60	75	59	41	11.82	.376
F. D.	28	170	84	40/2 50 90	130	5 32 42	21	9.25	1.41
F. E.	29	68	44	65/2 45	120/4	13.5 38.25	48.25	8.53	.405
F. F.	28	52	32	65/2 120/2	50	3.5 56.4	40.1	16.59	.425
F. G.	28	74	32	80/2 40/2 50	50	43.6 7.2 23.2	26	11.15	.425
F. H.	34½	105	90	50	50	54	46	5.16	.88
F. K.	28½	84	63	60	90	67	33	10.75	.62
F. M.	26	97	92	60	14/16 Denier	85	15	14.48	1.08

Under the heading "Style" are placed the different letters by which the various styles, dealt with in this work, will be known. The tables are divided into plain work and fancy work, single letters being used for all plain styles and two letters for fancy styles. The second column shows the width of the grey cloth.

The third column gives the sley of the cloth, that is, the number of warp ends to each inch.

In case the sley is not the same in all parts of the cloth, the number in this column should be taken as indicating the average sley.

The fourth column shows the pick of the goods, that is, the filling threads in each inch of the cloth. If the picks per inch vary, then this column shows the average pick.

The fifth and sixth columns give the counts of warp and filling, respectively, that are used in the construction of the cloth. Styles R. and F. M. call for silk filling. It is considered that this is purchased by the mill all prepared to go into the cloth.

The seventh and eighth columns gives the percentage of warp and filling, respectively, in a pound of cloth. For example, take style A, in 100 pounds of this cloth, there are 59 lbs. of 35s warp and 41 lbs. of 50s filling.

The ninth column gives the weight of each style, the weight being expressed in terms of yards per pound. Thus style A, for example, weighs 5 yds. per lb.

The tenth column shows the weaving price on each style. This price is based on a cut 60 yds. in length, that is, a weaver on style A, for example, is paid 24½c for each 60 yds. he turns out.

As previously stated, when the yarn reaches the warpers, it is possible to attach it to the different styles, and it is generally so run. For example, if a certain style calls for 2400 ends of 30s yarn, then this number of ends must be assembled on the warper beams, and is generally run for that style. It is, consequently, possible to ascertain the length of time devoted to warping the yarn for the various styles and there is no better method of figuring the cost on warpers than on the machine

hour basis. This method necessitates the keeping of an accurate record of the number of hours spent on each style, and consequently may entail a little extra work in this department, but it would seem that the advantage of knowing what it is costing to run each of the separate styles would much more than offset this small additional labor.

To illustrate this method, from the payroll of the room and from the division of the general pay, previously made, it is learned that the cost of the warping is 64.50 (productive labor)+3.59 (portion of general expense), or a total of 68.09.

There are 16 warpers being run, and as the work is based on a week of 54 hours, there are 864 machine hours (16x54). 68.09 (cost)÷864 (machine hours)=.078807, which is the cost per machine hour for operating the warpers.

If, now, 67 hours are spent on warping style A and there are 2456 pounds of this style warped, then 67x.078807, or 5.280069, is the total cost of warping on this style. This amount divided by 2456 (pounds run) gives the cost per pound on this style, or .002149.

The table on page 40 shows the warping cost per pound on each style, the result being obtained in each case by the above method. In this table the hours have been assumed.

Cost, per pound, on slashing:—The cost per pound of slashing may be obtained by the same method as in the case of warping, that is, by keeping a correct record of the time consumed in slashing each style, and multiplying the number of hours by the cost per machine hour to find the total labor cost on that style.

The labor cost of the slashers, according to the payroll, is 57.75, which added to 3.21 (portion of general expense) gives a total cost on slashing of 60.96

There are 3 slashers, which number multiplied by 54 (hours per week) gives a total of 162 machine hours, 6096 ÷162=.376296 slashing cost per machine hour.

Assuming that the number of hours spent on slashing each style, has been found to be as given in the table on page 41, then the cost per pound of slashing each style will be as shown in the same table.

Cost, Per Pound, on Warpers

Style.	Machine Hours.	Cost per Machine Hr.	Pounds Run.	Cost Per Pound.
A.	67	.078807	2456	.002149
B.	66	.078807	1254	.004147
C.	17	.078807	307	.004363
D.	61	.078807	450	.010682
E.	13	.078807	255	.004017
F.	17	.078807	297	.004510
G.	19	.078807	318	.004708
H.	20	.078807	342	.004608
J.	11	.078807	120	.007223
K.	24	.078807	414	.004568
L.	23	.078807	267	.006788
M.	36	.078807	667	.004253
N.	31	.078807	371	.006584
P.	37	.078807	440	.006626
R.	13	.078807	218	.004699
F. A.	31	.078807	801	.003049
F. B.	37	.078807	483	.006037
F. C.	19	.078807	333	.004469
F. D.	128	.078807	1371	.007357
F. E.	29	.078807	806	.002835
F. F.	34	.078807	609	.004399
F. G.	74	.078807	2015	.002894
F. H.	17	.078807	356	.003763
F. K.	24	.078807	424	.004460
F. M.	16	.078807	273	.004618

Cost, Per Pound, on Slashers

Style.	Machine Hours.	Cost Per Machine Hour.	Pounds Run.	Cost Per Pound.
A.	14	.376296	2456	.002145
B.	11	.376296	1254	.003300
C.	4	.376296	307	.004902
D.	10	.376296	450	.008362
E.	3	.376296	255	.004427
F.	4	.376296	297	.005068
G.	4	.376296	318	.004733
H.	4	.376296	342	.004401
J.	3	.376296	120	.009406
K.	4	.376296	414	.003635
L.	5	.376296	267	.007046
M.	6	.376296	667	.003384
N.	5	.376296	371	.005070
P.	6	.376296	440	.005131
R.	3	.376296	218	.005177
F. A.	8	.376296	801	.003758
F. B.	7	.376296	483	.005435
F. C.	4	.376296	333	.004493
F. D.	11	.376296	1371	.003019
F. E.	8	.376296	806	.003734
F. F.	10	.376296	609	.006178
F. G.	18	.376296	2015	.003361
F. H.	3	.376296	356	.003171
F. K.	4	.376296	424	.003549
F. M.	3	.376296	273	.004135

Cost, per pound, on drawing- and twisting-in:—The pay for drawing-in warps is generally based on so much a thousand ends, if drawn by hand. For example, a drawing-in hand may be paid 18c per thousand ends on plain work; 20c per thousand ends on 5 harness sateen work, while on fancies the pay may be based on 63c per thousand. Having the weight of warp yarn on the beam, the cost per pound for drawing-in, under such circumstances, is readily determined. There is, however, another point to be taken into consideration in connection with this department, namely, twisting-in. When a beam runs out at the loom and the same style is to be continued in that, or any other loom, the ends from a new beam may be twisted to the ends of the beam running out, and then pulled through the harness and reed, thus doing away with the drawing-in process. The person performing this operation may be paid by the piece, or by the day.

In any case it would not be a difficult matter to lay out some method by means of which the exact labor cost of drawing- and twisting-in each style could be readily ascertained.

There remains the portion of general expense that belongs to this work, and this is best distributed on the productive labor cost basis. This method is adopted in the table on page 43, which gives the total labor cost per pound for drawing- and twisting-in. It is assumed that the cost of the actual drawing- and twisting-in of each style has been found to be as shown in this table.

Take style A for an illustration, the productive labor cost is 59.84, but there remains to be added to this cost, its portion of the total general expense. To find what percentage should be added to the cost on each style, divide the total general expense on drawing-and twisting-in by the total productive labor cost

20.02÷359.90=.055626, or 5.5626%.

Then 59.84 (productive labor cost on style A)+5.5626%= 63.168659, or the total labor cost.

63.168659÷2456 (pounds run)=.025720, cost per lb.

In case warp drawing machines are being dealt with, the cost per pound may be obtained by keeping a record of the time spent on each style, and using the cost per machine hour basis.

COST, PER POUND, ON DRAWING- AND TWISTING-IN

Style.	Productive Labor Cost.	Productive Labor Cost + 5.5626%	Lbs. Run.	Cost Per Pound.
A.	59.84	63.168659	2456	.025720
B.	24.61	25.978955	1254	.020716
C.	5.48	5.784830	307	.018843
D.	8.45	8.920039	450	.019822
E.	3.84	4.053603	255	.015896
F.	4.44	4.686979	297	.015781
G.	6.27	6.618775	318	.020813
H.	7.06	7.452719	342	.021791
J.	2.29	2.417383	120	.020144
K.	7.87	8.307776	414	.020067
L.	5.64	5.953730	267	.022298
M.	13.08	13.807588	667	.020701
N.	6.72	7.093806	371	.019120
P.	8.43	8.898927	440	.020224
R.	4.26	4.496966	218	.020628
F. A.	12.65	13.353668	801	.016671
F. B.	12.32	13.005312	483	.026926
F. C.	6.29	6.639887	333	.019820
F. D.	54.11	57.119922	1371	.041662
F. E.	13.11	13.839256	806	.017170
F. F.	11.52	12.160811	609	.019968
F. G.	52.36	55.272577	2015	.027435
F. H.	10.71	11.305754	356	.031757
F. K.	12.81	13.522569	424	.031892
F. M.	5.74	6.059293	273	.022195

Weavers Pay Only

Style.	Cost Per Yard.	Yards Per Pound.	Cost Per Pound.
A.	.004083	5.00	.020415
B.	.004083	8.50	.034705
C.	.00385	11.75	.045237
D.	.004083	16.46	.067206
E.	.00325	12.30	.039975
F.	.00325	14.10	.045825
G.	.004083	11.00	.044913
H.	.004083	10.66	.043524
J.	.003416	15.36	.052469
K.	.003	13.06	.03918
L.	.003666	14.52	.04323
M.	.004083	10.31	.042095
N.	.0055	6.75	.037125
P.	.005	6.75	.03375
R.	.0055	14.63	.080465
F. A.	.006266	10.96	.068675
F. B.	.016666	10.31	.171826
F. C.	.006266	11.82	.074064
F. D.	.0235	9.25	.217375
F. E.	.00675	8.53	.057577
F. F.	.007083	16.59	.117506
F. G.	.007083	11.15	.078975
F. H.	.014666	5.16	.075676
F. K.	.010333	10.75	.111079
F. M.	.018	14.48	.26064

Weave Room

The weave room presents no difficult problems when obtaining the cost per pound. Practically all mills pay their weavers on the piece work basis, the pay being based on so much a cut—a cut being a certain number of yards of cloth. The number of yards in a cut will vary with different mills.

Having the length of the cut, the weaving price per cut, and the yards per pound of the cloth, the labor cost per pound of weaving is readily obtained.

Take style A for example, and referring to page 36 the weaving price as shown here is 24½c per cut, this price being based on a cut 60 yards in length. The goods weigh five yards to the pound. Then .245 (price per cut)÷60 (yards per cut) =.004083 cost per yard, and as there are five yards to the pound, the cost per pound is 5×.004083=.020415.

This method is followed in the table on page 44, which shows the weaving pay per pound on both the plain and fancies.

After having obtained the cost per pound, as related to the actual weaving process alone, there remains to be distributed such general labor as the loom fixers, changers over, smash piecers and so on.

These costs are shown on page 46, which gives the pay in the weave room outside of the actual weaving. Three divisions are made in the pay, the first division including all persons that may be considered general to the whole room, the second division being confined to persons having to do with the plain looms alone, and the third division being confined to those persons whose work brings them in direct contact with the fancy looms only.

No better single method of distributing these costs can be obtained than on the loom basis, although in some minor instances it may not be accurate. For example, the number of filling carriers employed is not in proportion to the number of looms in operation, but is rather in proportion to the pounds of filling used. However, to make exceptions in these few cases would entail labor that the results would hardly justify, and, as above stated, there is no better method of distributing

Weave Room Pay (Day Labor)

Occupation.	Amount.	Total.
1 Overseer	35.00	
1 Second hand	20.00	
1 Clerk	9.00	
3 Smash piecers	34.32	
1 Beam carrier	7.98	
3 Filling carriers	23.94	
1 Scrubber	5.80	136.04 (General)
8 Plain fixers	128.80	128.80 (Plain)
10 Fancy fixers	156.00	
3 Changers over	39.99	
2 Chain boys	10.24	
4 Drop-wire boys	31.92	238.15 (Fancies)
Total		502.99
Weavers pay on plain work		551.85
Weavers pay on fancy work		1279.18
Total weave room pay roll		2334.02

the pay in the weave room, outside of the weavers pay, than on the loom basis.

There are, however, certain costs that should be charged directly to the fancy work, as they are not a charge on the plain. There are also certain charges that go to the plain work only, and still other charges that are common to both the plain and the fancy. It is necessary, therefore, first to split the charges common to both, on the loom basis, after which the plain and fancy looms can be handled separately.

In this connection it is necessary to know the number of looms on each style, and this information is given in the table on page 47, together with the number of pounds run on each style:

Plain

Style.	Number of Looms.	Pounds run.
A.	125	4163
B.	125	2450
C.	35	522
D.	75	759
E.	25	423
F.	35	517
G.	35	530
H.	35	547
J.	15	191
K.	35	596
L.	30	382
M.	70	1131
N.	70	1279
P.	70	1381
R.	35	295
Totals	815	15166
	Fancy	
F. A.	75	1309
F. B.	70	823
F. C.	35	567
F. D.	125	1735
F. E.	45	1559
F. F.	50	1017
F. G.	90	2723
F. H.	25	659
F. K.	35	632
F. M.	35	321
Totals	585	11345

Weave Room General Expense

Style.	No. of Looms.	Cost Per Loom.	Pounds Run.	Cost Per Pound.
A.	125	.255202	4163	.007662
B.	125	.255202	2450	013020
C.	35	.255202	522	.017111
D.	75	.255202	759	.025217
E.	25	.255202	423	.015082
F.	35	.255202	517	.017276
G.	35	.255202	530	.016853
H.	35	.255202	547	.016329
J.	15	.255202	191	.020042
K.	35	.255202	596	.014986
L.	30	.255202	382	.020042
M.	70	.255202	1131	.015795
N.	70	.255202	1279	.013967
P.	70	.255202	1381	.012935
R.	35	.255202	295	.030278
F. A.	75	.504273	1309	.028892
F. B.	70	.504273	823	.042890
F. C.	35	.504273	567	.031128
F. D.	125	.504273	1735	.036330
F. E.	45	.504273	1559	.014555
F. F.	50	.504273	1017	.024792
F. G.	90	.504273	2723	.016667
F. H.	25	.504273	659	.019130
F. K.	35	.504273	632	.027926
F. M.	35	.504273	321	.058098

There is a total of 1400 looms on the plain and fancy work. 815 looms, or 58.21% are on plain, and 585, or 41.79% are on fancy. Then 58.21% of 136.04 (general room expense), or 79.19, must be charged to the plain, which added to the direct charge of 128.80 on the plain, gives a total of 207.99 to be distributed among the plain looms. Dividing this amount by the number of plain looms, or 815, gives .255202 as the cost per loom.

Similarly, 41.79% (% on fancies) of 136.04 (general room expense), or 56.85, is the amount to be charged to the fancies, which added to the direct charge of 238.15 on fancies, gives a total of 295.00 to be distributed. This amount divided by 585 (number of fancy looms) gives .504273 as the cost per loom on this portion of the work.

To obtain the cost per pound, multiply the cost per loom on the plain, if it is plain loom work; or by the cost per loom on the fancies, if fancy, by the number of looms on that style and divide the result by the pounds run of that style.

For example, on style A there are 125 looms, which multiplied by .255202 (cost per loom on the plain), gives 31.900250. This amount divided by 4163 (pounds run), gives .007662 cost per pound. Continuing with each style, according to the above method, gives the results shown on page 48.

Cloth Room

The labor cost per pound in the cloth room is best obtained by dividing the total of the payroll by the total yards run, to first find the cost per yard, after which the cost per pound of the different styles is determined by multiplying the cost per yard by the yards per pound.

Obtaining the cost per pound from the average cost per yard, in accordance with the above, does not take into account every little variation that may cause some one style to cost more per yard than another in the cloth room. The cost in this department, however, is so small in the case of mills that do not finish their own goods, that the average gives results near enough for all practical purposes.

Cost, Per Pound, in Cloth Room

Style.	Cost Per Yard.	Yards Per Pound.	Cost Per Pound.
A.	.000751	5.00	.003755
B.	.000751	8.50	.006383
C.	.000751	11.75	.008824
D.	.000751	16.46	.012361
E.	.000751	12.30	.009237
F.	.000751	14.10	.010589
G.	.000751	11.00	.008261
H.	.000751	10.66	.008005
J.	.000751	15.36	.011535
K.	.000751	13.06	.009808
L.	.000751	14.52	.010904
M.	.000751	10.31	.007742
N.	.000751	6.75	.005069
P.	.000751	6.75	.005069
R.	.000751	14.63	.010987
F. A.	.000751	10.96	.008230
F. B.	.000751	10.31	.007742
F. C.	.000751	11.82	.008876
F. D.	.000751	9.25	.006946
F. E.	.000751	8.53	.006406
F. F.	.000751	16.59	.012459
F. G.	.000751	11.15	.008373
F. H.	.000751	5.16	.003875
F. K.	.000751	10.75	.008073
F. M.	.000751	14.48	.010874

In the case of mills that finish their goods, the conditions are different, and in such cases a method should certainly be applied that will place the correct cost on each style.

The pay roll of the cloth room is as follows:

Occupation	Amount
1 Overseer	20.00
1 Clerk	7.50
20 Inspectors	122.80
3 Folders	22.80
1 Pressman	12.00
1 Helper	7.00
Total	192.10

The total of the payroll, 192.10, divided by 255567 (yards run), gives .000751 as the cost per yard. Multiplying the cost per yard, by the yards per pound of any style, gives the cost per pound as shown in table on page 50.

Summary of Labor Costs

It is now possible to obtain the total labor cost per pound on the different styles being run, and it is advisable to do so at this point. There is one point that presents itself in this connection and one that is important to a correct understanding of the method adopted when assembling the labor costs in different departments, in order to obtain the total labor cost on any particular style; that is, that a pound of cloth, which is the amount used when denoting the cost, is made up of a fractional part of a pound of warp yarn, and a fractional part of a pound of filling yarn. It is not, consequently possible to attach directly to a pound of cloth, the labor cost of spinning for instance. The labor costs

on the different yarns must first be assembled, and brought down to that point where the yarns for the first time are considered as a part of a certain style, which in the case being dealt with, is at the warpers.

After having found the labor cost per pound of the warp yarn up to this point, it is not the labor cost of one pound of a certain yarn that is used, but the labor cost per pound of that style into which the yarn may pass. To the labor cost per pound of the warp yarn, there is added the labor cost per pound of warping, slashing and drawing-in for the style using this yarn.

This brings the calculation up to the weaving, at which point the percentage of warp and filling in a pound of cloth must be used, to determine how much of the yarn cost is warp and how much is filling. Take style A for an example, this cloth is made from 35s warp and 50s filling. The labor cost per pound on these two counts, up to the warping, is as follows, these figures being taken from tables given on previous pages.

	35s warp	50s filling
Labor cost per lb. card room	.013916	.017397
Labor cost per lb. spinning room	.011408	.020187
Labor cost per lb. spooling	.005905	
Total	.031229	.037584

From this point, up to the weaving, the warp yarn alone is considered and the figures are as follows:

Labor cost per pound on 35s warp yarn up to and including spooling, = .031229
Labor cost per pound on warping, style A, = .002149
Labor cost per pound on slashing, style A, = .002145
Labor cost per pound on drawing-in, style A, = .025720

Total labor cost per pound, warp yarn, style A, up to weaving, = .061243

59% of the weight of the cloth is warp yarn, then 59% of .061243, or .036133, represents the labor cost on the warp yarn in one pound of cloth.

41% of the weight of the cloth is filling yarn, then 51% of .037584, or .015410, is the labor cost on the filling yarn in one pound of cloth. Combining these two, and adding to them the labor cost per pound in the weave room and cloth room, gives the total labor cost per pound.

Labor cost per pound, on warp, = .036133
Labor cost per pound, on filling, = .015410
Weaving cost per pound, = .020415
Cost per pound, general expense in weave room, = .007662
Labor cost per pound in cloth room, = .003755

Total labor cost per pound, style A, = .083375

If the warp yarns, in any style, contain different counts of yarn, carry each separate count through, up to the weaving, exactly as though it were the only count in the cloth, then split the total costs of each, up to this point, by the percentage that each bears to a pound of cloth.

The following tables give the total labor cost per pound on each style, worked out as stated above. All figures used are from tables previously given.

Labor Cost Per Pound of Warp Yarns, Up to Warping

CARDED

Stock	1⅛	1⅛	1⅛	1¼	1¼ E	1¼	1¼	1¼
Hk. Roving	8	8	8	10	10	10	12	12
Counts	35	40	40/2	45	45 Hard twist	50	55	60
Card Room	.013916	.013916	.013916	.017397	.022384	.022412	.024375	.024375
Spinning Room	.011408	.013702	.013702	.015919	.025339	.018686	.021134	.023873
Spooling	.005905	.006152	.006152	.006644	.006644	.007136	.007382	.007874
Twisting			.012118					
Total	.031229	.033770	.045888	.039960	.054367	.048234	.062891	.056122

1¼ E	1¼ E	1¼ E	1⅜	1⅜	1⅜	1⅜	1½ s.i.	1½ s.i.
14	14	14	14	16	16	18	20	25
65 Hard twist	65/2	65/2 Hard twist	70	80	80/2	90	100	120/2
.029413	.029413	.029413	.029835	.032543	.032543	.035665	.042053	.052377
.042977	.042977	.042977	.030698	.036830	.036830	.042974	.051517	.067858
.008612	.008612	.008612	.009351	.011073	.011073	.014149	.018456	.024608
	.020749	.036203			.025699			.047400
.081002	.101751	.117205	.069884	.080446	.106145	.092788	.112026	.192243

Labor Cost Per Pound of Filling Yarns, Up to Weaving

CARDED

Stock	1⅛	1⅛	1¼	1¼ E	1¼	1⅜	1⅜	1⅜ s.i.
Hk. Roving	8	8	10	10	12	14	16	18
Counts	40	40/2	50	45	60	70	75	85
Card Room	.013916	.013916	.017397	.022384	.024375	.029835	.032543	.036570
Spinning Room	.013912	.013912	.020187	.017187	.026275	.033162	.036644	.043532
Twisting		.010262						
Total	.027828	.038090	.037584	.039571	.050650	.062997	.069187	.080102

1⅜ s.i.	1⅜	1½ s.i.	1⁷⁄₁₆ E	1½ s.i.
18	20	25	25	25
90	100	120	120/4 Hard twist	130
.036570	.040634	.052377	.050018	.052377
.048025	.055685	.072883	.099458	.086430
			.031224	
.084595	.096319	.125260	.180700	.138807

Labor Cost Per Pound of Warp

Style	A.	B.	C.	D.	E.	F.	G.
Counts	35	55	60	90	50	60	60
Yarn costs from pages 54 and 55	.031229	.062891	.056122	.092788	.048234	.056122	.056122
Warping	.002149	.004147	.004363	.010682	.004017	.004510	.004708
Slashing	.002145	.003300	.004902	.008362	.004427	.005068	.004733
Drawing- and Twisting-in	.025720	.020716	.018843	.019822	.015896	.015781	.020813
Total	.061243	.091054	.084230	.131654	.072574	.081481	.086376

Labor Cost Per Pound of Warp

Style	F. A.	F. B.		F. C.	F. D.		
Counts	45	80	40/2 Mer.	60	40/2	50	90
Yarn costs from pages 54 and 55	.039960	.080446	.04588	.056122	.045888	.048234	.092788
Warping	.003049	.006037	.006037	.004469	.007357	.007357	.007357
Slashing	.003758	.005435	.005435	.004493	.003019	.003019	.003019
Drawing- and twisting-in	.016671	.026926	.026926	.019820	.041662	.041662	.041662
Total	.063438	.118844	.084286	.084904	.097926	.100272	.144826

Yarns in Plain Styles, Up to Weaving

H.	J.	K.	L.		M.	N.	P.	R.
60	80	60	100	50	55	70	70	60
.056122	.080446	.056122	.112026	.048234	.062891	.069884	.069884	.056122
.004608	.007223	.004568	.006788	.006788	.004253	.006584	.006626	.004699
.004401	.009406	.003635	.007046	.007046	.003384	.005070	.005131	.005177
.021791	.020144	.020067	.022298	.022298	.020701	.019120	.020224	.020628
.086922	.117219	.084392	.148158	.084366	.091229	.100658	.101865	.086626

Yarns in Fancy Styles, Up to Weaving

F. E.		F. F.		F. G.			F. H.	F. K.	F. M.
65/2 Hard twist	45 Hard twist	65/2	120/2	80/2	40/2	50	50	60	60
.117205	.054367	.101751	.192243	.106165	.045888	.048234	.048234	.056122	.056122
.002835	.002835	.004399	.004399	.002894	.002894	.002894	.003763	.004460	.004618
.003734	.003734	.006178	.006178	.003361	.003361	.003361	.003171	.003549	.004135
.017170	.017170	.019968	.019968	.027435	.027435	.027435	.031757	.031892	.022195
.140944	.078106	.132296	.222788	.139855	.079578	.081924	.086925	.096023	.087070

Total Labor Cost Per Pound on Plain Styles

Style	A.	B.	C.	D.	E.	F.	G.
Counts warp	35	55	60	90	50	60	60
Counts filling	50	60	85	130	75	75	85
% warp	59	51	59	59	60.2	57.2	60
% filling	41	49	41	41	39.8	42.8	40
Warp cost	.036133	.046438	.049696	.077676	.043690	.046607	.051826
Filling cost	.015410	.024819	.032842	.056911	.027537	.029612	.032041
Weaving	.020415	.034705	.045237	.067206	.039975	.045825	.044913
General expense, weaving	.007662	.013020	.017111	.025217	.015082	.017276	.016853
Cloth room	.003755	.006383	.008824	.012361	.009237	.010589	.008261
Total	.083375	.125365	.153710	.239371	.135521	.149909	.153894

Total Labor Cost Per Pound on Fancy Styles

Style	F. A.	F. B.		F. C.	F. D.		
Counts warp	45	80	40/2 Mer.	60	40/2	50	90
Counts filling	70	100	40/2 Mer.	75		130	
% warp	61	43	15.8	59	5	32	42
% filling	39	27.3	13.9	41		21	
Warp cost	.038697	.051103	*.022797	.050093	.004896	.032087	.060827
Filling cost	.024569	.026295	*.013634	.028367		.029149	
Weaving	.068675		.171826	.074064		.217375	
General expense, weaving	.028892		.042890	.031128		.036330	
Cloth room	.008230		.007742	.008876		.006946	
Total	.169063	.077398	.258889	.192528	.004896	.321887	.060827
		.336287			.387610		

*6c added to labor cost, per pound, for mercerizing.

Total Labor Cost Per Pound on Plain Styles

H.	J.	K.	L.		M.	N.	P.	R.
60	80	60	100	50	55	70	70	60
90	120	90		120	75	45	45	22/26 Denier
62.5	63	69.5	25.3	44.6	59	29	32	74
37.5	37	30.5		30.1	41	71	68	26
.054326	.073848	.058653	.037484	.037627	.053825	.029191	.032597	.064103
.031723	.046346	.025802		.037703	.028367	.028096	.026908	
.043524	.052469	.039180		.043230	.042095	.037125	.033750	.080465
.016329	.020042	.014986		.020042	.015795	.013967	.012935	.030278
.008005	.011535	.009808		.010904	.007742	.005069	.005069	.010987
.153907	.204240	.148429	.037484	.149506	.147824	.113448	.111259	.185833
			.186990					

Total Labor Cost Per Pound on Fancy Styles

F. E.		F. F.		F. G.			F. H.	F. K.	F. M.
All hard twist 65/2	45	65/2	120/2	80/2	40/2	50	50	60	60
	120/4		50		50		50	90	14/16 Denier
13.5	38.25	3.5	56.4	43.6	7.2	23.2	54	67	85
	48.25		40.1		26		46	33	15
.019028	.029876	.004630	.125653	.060977	.005730	.019006	.046940	.064336	.074010
	.087188		.015071		.009772		.017289	.027916	
	.057577		.117506		.078975		.075676	.111079	.260640
	.014555		.024792		.016667		.019130	.027926	.058098
	.006406		.012459		.008373		.003875	.008073	.010874
.019028	.195602	.004630	.295481	.060977	.119517	.019006	.162910	.239330	.403622
.214630		.300111		.199500					

Part II

OVERHEAD COSTS

Having distributed the costs that may properly come under the head of labor, there remain those costs, continually going on in all manufacturing concerns, although possibly not as tangible as are the labor costs. Such costs are commonly termed mill overhead and include taxes, insurance, interest, depreciation and so on.

The first object when making a correct distribution of these costs, is to subdivide them in such a manner that each unit of the mill will bear its correct proportion. As an aid to this distribution, three main divisions of the mill may be made, namely, building, land, machinery. Under each of these three main divisions are placed the different units into which the plant has previously been divided. This is shown, for the buildings, on page 61. The overhead consists of taxes, 101.22; insurance, 4.03; interest, 388.57; repairs, 38.46; and depreciation 140.90; making a total of 673.18, to be distributed under this heading. The interest, shown here, is the interest on the investment in the buildings, and is not interest paid out for money borrowed. The depreciation on buildings is figured at 2½%. The propriety of including these charges at this point is discussed in later pages, the above explanation being all that is deemed necessary here. The item of repairs includes only those general repairs of the building that cannot be attached directly to some one unit.

It is next necessary to distribute this total charge of 673.18 to the different units on some equitable basis, and the cost basis is considered best for this particular case. The

Buildings

Taxes	101.22	Repairs	38.46
Insurance	4.03	Depreciation	140.90
Interest	388.57		

Total amount to be distributed..... 673.18

Unit.	Cost.	Per cent.	Distribution.
Office	10000.00	3.00	20.19
Shop	2533.30	.76	5.12
Picking	5156.41	1.55	10.43
Carding	10607.52	3.19	21.47
Combing	7387.24	2.21	14.88
Drawing	2281.44	.68	4.58
Slubbing	1568.00	.47	3.16
1st Int.	2058.00	.62	4.17
2nd Int.	4198.32	1.26	8.48
Jacks	16816.80	5.05	34.00
Spinning—warp	37436.00	11.24	75.67
Spinning—filling	33908.00	10.20	68.66
Spooling	5096.00	1.53	10.30
Twisting	6209.28	1.86	12.52
Warping	5268.48	1.58	10.64
Slashing	4074.84	1.22	8.21
Drawing-in	2626.40	.79	5.32
Weaving—plain	84272.50	25.30	170.31
Weaving—fancy	60489.00	18.16	122.25
Cloth room	3528.00	1.06	7.14
Storage	8640.00	2.59	17.44
Power	18920.00	5.68	38.24
Total	333075.53	100.00	673.18

first column shown on page 61 contains the different units into which the mill has previously been divided, the second column shows the cost of the building for each of these units, while the third column shows the percentage that each cost bears to the total cost. The last column gives the portion of the overhead to be charged to each separate unit, and is found by obtaining each unit's percentage of the total distribution. Take the office for example, the cost of building is 10,000; this amount is 3% of the total cost for building construction, then 3% of 673.18, or 20.19, is the portion of the overhead, on all buildings, chargeable to office alone.

The distribution under the heading "Land" is shown on page 63. Under this heading are included all charges, not previously distributed, that may be said to cost in direct proportion to the number of square feet occupied by each unit. The taxes are the taxes on the land only, and the interest is interest on money invested in the land.

The distribution of the total charge of 129.61 is made on the basis of the floor space occupied by each unit. The calculations are carried out exactly as described when dealing with the overhead on buildings.

The distribution under the heading "Machinery" is shown on page 64. The separate amounts consist of taxes on the machinery, 269.58; insurance on the machinery, 10.75; interest on the money invested in the machinery, 949.76; and depreciation on the machinery, figured at 4%, and amounting to 626.22; making a total of 1856.31 to be divided between the different units. The method adopted, in making the distribution, is the cost basis. In the second column is shown the cost of the machinery in each separate unit, while the third column gives the percentage that the cost of each unit bears to the cost of all the machinery. The last column gives the portion of the overhead to be charged to each unit and is obtained in the same manner as described in connection with the overhead on buildings.

Although not strictly a part of the mill overhead, yet capable of being included with it and attached to the separate units, are other expenses that come under the headings of

Land

Taxes	12.70	Heating and humidifying	23.81
Interest	35.00	Watchman	10.00
Lighting	48.10		

Total amount to be distributed..... 129.61

Unit.	Floor Space.	Per cent.	Distribution.
Office	5000	1.78	2.31
Shop	2585	.92	1.19
Picking	5198	1.85	2.40
Carding	10824	3.85	4.99
Combing	7538	2.69	3.49
Drawing	2328	.83	1.07
Slubbing	1600	.57	.74
1st Int.	2100	.75	.97
2nd Int.	4284	1.52	1.97
Jacks	17160	6.10	7.91
Spinning—warp	38200	13.58	17.60
Spinning—filling	34600	12.30	15.94
Spooling	5200	1.85	2.40
Twisting	6336	2.25	2.92
Warping	5376	1.91	2.47
Slashing	4158	1.48	1.92
Drawing-in	2680	.95	1.23
Weaving—plain	51860	18.44	23.90
Weaving—fancy	37224	13.24	17.16
Cloth room	3600	1.28	1.66
Storage	24000	8.50	11.02
Power	9460	3.36	4.35
Total	281311	100.00	129.61

Machinery

Taxes	269.58	Interest	949.76
Insurance	10.75	Depreciation	626.22

Total amount to be distributed.... 1856.31

Unit.	Value.	Per cent.	Distribution.
Shop	5000.00	.62	11.51
Picking	12371.75	1.24	23.02
Carding	56580.27	6.96	129.20
Combing	49060.00	6.04	112.12
Drawing	7288.50	.90	16.71
Slubbing	5111.52	.63	11.69
1st Int.	9509.72	1.17	21.72
2nd Int.	31211.52	3.84	71.28
Jacks	86088.74	10.59	196.58
Spinning—warp	108845.96	13.51	250.79
Spinning—filling	98847.00	12.16	225.73
Spooling	4923.00	.61	11.32
Twisting	17820.00	2.19	40.65
Warping	6090.20	.75	13.92
Slashing	4870.00	.60	11.14
Drawing-in	396.87	.05	.93
Weaving —plain	120245.68	14.79	274.55
Weaving—fancy	91406.80	11.24	208.65
Cloth room	4190.00	.52	9.65
Power	94228.00	11.59	215.15
Total	814085.53	100.00	1856.31

power, repair shop and supplies. The different units, into which the mill has been subdivided, contain both productive and non-productive units, the latter embracing such units as the office, storage, shop and power.

It should be one of the main objects, in distributing the costs under the non-productive units, to so arrange them that they will be attached to the productive units in a correct manner. The costs under power and shop lend themselves readily to such an arrangement, and will be treated in this manner.

Office and storage, however, will be dealt with separately. The distribution under power is shown on page 66. The first item of expense, 38.24, is the overhead expense on the buildings devoted to the power plant, and is obtained from the sheet previously made up for overhead on buildings and shown on page 61.

Similarly the charges of 4.35 for land, and 215.15 for machinery, are obtained from the pages showing the overhead under these headings, the object being to include them with the other expenses of power and then distribute them to the productive units.

The fourth item of expense under power, 86.00, covers the cost of insurance and depreciation, over and above what has been already charged for these two items under overhead, it being considered that the equipment of the power plant depreciates more rapidly than that of the manufacturing units, also there is the additional insurance for the boilers that should be taken into account.

The next item, coal and labor, covers the expense of the fuel and the help in the power plant. Repairs and supplies, 40.00, are taken from the repair sheet explained in later pages.

The total amount to be distributed is 957.64 and the distribution is made on the horse power basis. The different units are again set down and opposite each unit is placed the H. P. required to drive the machinery it contains. The third column contains the percentage that the H. P. of each unit bears to the total H. P. Under the heading "Distribution" is placed the portion of overhead to be charged up to each unit, and these amounts are obtained by

NOTE: The expenses under power, repairs, and supplies, are commonly termed "works expense". In future pages, however, the single term overhead will be used when referring to overhead, works expense, or to both.

Power

Overhead from "Building"	38.24
" " "Land"	4.35
" " "Machinery"	215.15
Additional insurance and depreciation	86.00
Coal and labor	573.90
Repairs and supplies	40.00
Total amount to be distributed	957.64

Unit.	H. P.	Per cent.	Distribution.
Shop	10	.43	4.12
Picking	80	3.41	32.66
Carding	98	4.17	39.93
Combing	32	1.36	13.02
Drawing	15	.64	6.13
Slubbing	10	.43	4.12
1st Int.	15	.64	6.13
2nd Int.	50	2.13	20.40
Jacks	180	7.66	73.35
Spinning—warp	740	31.50	301.65
Spinning—filling	520	22.12	211.83
Spooling	8	.34	3.26
Twisting	90	3.83	36.68
Warping	5	.21	2.01
Slashing	6	.25	2.39
Weaving—plain	250	10.65	101.99
Weaving—fancy	230	9.80	93.85
Cloth room	10	.43	4.12
Total	2349	100.00	957.64

taking the proper percentage of the total amount for distribution. This method is the same as the one adopted when distributing the overhead on buildings, land and machinery.

The distribution of the costs in the repair shop is shown on page 68. The overhead of this department consists of 5.12, taken from the overhead on buildings, shown on page 61; 1.19 taken from the overhead on land, shown on page 63; 11.51, taken from the overhead on machinery, shown on page 64; and 4.12 from the power sheet on page 66, making a total of 21.94. In addition to this amount, there are also the expenses due to labor in the repair shop and material used. It is assumed that a record is kept of each repair job and the time and material charged up to the proper units.

The second column, under "Repair Shop," contains the separate amounts expended on each unit for labor in making the repairs, the third column contains the amounts expended for material for repairs, while the fourth column shows the distribution of the overhead on the repair shop. The distributions in this column are made on a percentage basis obtained from the amounts expended for labor, that is, the items in the overhead column bear the same ratio to the total for overhead, that the items in the labor column bear to the total for labor.

Note that there is no charge for overhead against power, on this sheet. Since there is a charge for power against repair shop, and also a charge for power used in the repair shop, against the power plant, one of these charges must either be omitted or estimated, before making up the charge for the other. In this case the charge against the power plant has been omitted.

The amounts expended for supplies are also included on this sheet. It is assumed that an accurate record is kept of all supplies given out, and the proper charge made, for the same, to each unit. The charges against power on this sheet, namely, 9.00 for labor; 15.00 for materials and 16.00 for supplies, or a total of 40.00, have been carried to the power sheet shown on page 66 and there distributed.

The several items, on the different distribution sheets, may now be totaled for each productive unit, eliminating the

Repair Shop

Overhead from "Building"	5.12
" " "Land"	1.19
" " "Machinery"	11.51
Power	4.12
Total of overhead charges.....	21.94

Unit.	Labor.	Material.	Overhead Charges.	Supplies.
Office				20.00
Picking	1.20	4.52	.17	4.14
Carding	2.70	9.40	.39	8.62
Combing	4.80	16.66	.70	15.21
Drawing	1.50	5.24	.22	4.80
Slubbing	1.20	4.86	.17	4.51
1st Int.	1.80	6.60	.27	6.13
2nd Int.	4.20	14.27	.60	13.25
Jacks	9.90	33.85	1.44	31.43
Spinning—warp	7.20	24.20	1.05	22.18
Spinning—filling	8.40	28.22	1.22	25.87
Spooling	4.20	14.08	.60	12.97
Twisting	3.80	12.60	.55	14.00
Warping	2.10	7.85	.31	7.19
Slashing	1.50	5.30	.22	164.00
Weaving—plain	28.10	97.20	4.08	89.10
Weaving—fancy	61.50	205.92	8.94	188.76
Cloth room	6.90	23.05	1.01	69.63
Power	9.00	15.00		16.00
Total	160.00	528.82	21.94	717.79

power and repair shop, since these have been absorbed in the productive units. The charges against office and storage will be dealt with together, and in later pages.

The summary of these overhead charges is shown on page 70. On this sheet the productive units only are shown, and against each unit are placed the amounts distributed to it in the previous pages. Taking the picking for an example, and following across the page; under the first heading, which is "Buildings," there is a charge against this unit of 10.43, this amount being the same as the charge against picking, shown on the sheet giving the distribution of the overhead on buildings, page 61. Under land there is a charge of 2.40, which is the amount charged against picking on page 63; under machinery the charge is 23.02, which is obtained from the machinery sheet on page 64; under power the amount 32.66 is taken from the power sheet, page 66, and the amounts under repairs and supplies, 5.89 and 4.14 respectively, are taken from the repair and supply sheet, page 68. The total of these separate items amounts to 78.54 and this amount is placed in the final column. It should be understood that, in practice, the distributions shown on previous pages would not be made in such detail. All of the distributions, so far shown, can be combined in one distribution sheet and the totals carried out on the same sheet. The method, employed here, is for explanation purposes solely. All the overhead expense, also such expenses as power, repairs and supplies, have been distributed to the different units and it now remains to distribute the total amount on each unit, between the different stocks, or different styles, passing through that particular unit.

In the case of each separate unit some equitable method must be obtained, on which to base this distribution, and it is readily apparent that the same basis will not serve in all cases. There is, however, one element that is an important factor in this distribution, namely time; it being apparent that if it takes twice as long for a pound of one kind of stock to pass through a certain unit as it does that of another class to pass through the same unit, then the overhead charges on the first must be just twice as heavy as those on the second.

Summary of Overhead Charges

Unit	Buildings	Land	Machinery	Power	Repairs	Supplies	Total
Picking	10.43	2.40	23.02	32.66	5.89	4.14	78.54
Carding	21.47	4.99	129.20	39.93	12.49	8.62	216.70
Combing	14.88	3.49	112.12	13.02	22.16	15.21	180.88
Drawing	4.58	1.07	16.71	6.13	6.96	4.80	40.25
Slubbing	3.16	.74	11.69	4.12	6.23	4.51	30.45
1st Int.	4.17	.97	21.72	6.13	8.67	6.13	47.79
2nd Int.	8.48	1.97	71.28	20.40	19.07	13.25	134.45
Jacks	34.00	7.91	196.58	73.35	45.19	31.43	388.46
Spinning—warp	75.67	17.60	250.79	301.65	32.45	22.18	700.34
Spinning—filling	68.66	15.94	225.73	211.83	37.84	25.87	585.87
Spooling	10.30	2.40	11.32	3.26	18.88	12.97	59.13
Twisting	12.52	2.92	40.65	36.68	16.95	14.00	123.72
Warping	10.64	2.47	13.92	2.01	10.26	7.19	46.49
Slashing	8.21	1.92	11.14	2.39	7.02	164.00	194.68
Drawing-in	5.32	1 23	.93				7.48
Weaving—plain	170.31	23.90	274.55	101.99	129.38	89.10	789.23
Weaving—fancy	122.25	17.16	208.65	93.85	276.36	188.76	907.03
Cloth room	7.14	1.66	9.65	4.12	30.96	69.63	123.16

It is, of course, possible in but a few cases to know accurately the amount of time devoted to each class of work, and this is not necessary, since there is, most always, some data available that is itself so closely related to the element of time that it will serve all purposes equally well.

Take, for an example, piece work on a unit such as roving frames. The price of this work is very accurately based on the amount of work that can be turned out in a given time. If, then, the amounts that have been paid on these machines for piece work are known, and they should be, then these amounts can be used, when distributing the overhead, with practically as accurate results as would be obtained if the exact amount of time spent on each hank roving was known.

Again, in the case of weaving, if the number of looms on each style, and the pounds of goods turned out, are known, then by using these items in the distribution of the overhead we are practically using the element of time, since the time it takes to weave a pound of cloth of a certain style, regulates the number of looms required to give the necessary production.

Consequently, although the actual hours consumed, in turning out a certain production, may not be used when making the distribution of the overhead at the different units, yet the element of time is the chief factor, and in selecting a method of distribution, for any particular unit, it should be the aim to select a method that will fit this requirement.

Card Room

Cost, per pound, on pickers, cards, combers, and drawframes:—The total amount to be distributed on the picking unit is 78.54. If the stock should all be run through the pickers at the same rate, and treated in exactly the same manner in the card, then it would be correct to say that the total cost of overhead on pickers divided by the final pounds of roving turned out in the card room, gives the cost per pound of picker overhead on all stocks. If, however, the different stocks do not pass through the pickers at the same rate, which

PICKERS, CARDS, COMBERS, AND DRAW FRAMES

Unit.	Costs.	Pounds Produced.	Cost per Pound.
Picking	78.54	27489	.002857
Carding	216.70	27489	.007883
Combing	180.88	20290	.008914
Drawing	40.25	27489	.001464

SLUBBERS

30.45 (overhead cost)÷23.21 (piece work cost)=1.3119, or 131.19%

Hank.	Piece Work Cost, Per Pound.	Per Cent. To Be Taken.	Overhead Cost, Per Pound.
.60	.000832	131.19%	.001091
.70	.000978	131.19%	.001283

1ST INTERMEDIATES

47.79 (overhead cost)÷30.22 (piece work cost)=1.5814, or 158.14%

Hank.	Piece Work Cost, Per Pound.	Per Cent. To Be Taken.	Overhead Cost, Per Pound.
1.04	.000589	158.14%	.000931
1.35	.001028	158.14%	.001625
1.65	.001316	158.14%	.002081
2.00	.001588	158.14%	.002511

is the case with the mill under consideration, then it is not perfectly accurate to employ the above method.

Moreover, some of the stock is carded and some combed; the combed work loses much more in waste than the carded, and to say that the final pounds produced in the card room show the relative amount of each stock to pass through the picker is not correct. This latter point is taken up more fully under raw stock cost in later pages.

The question then is, does the difference that would be shown in the cost per pound warrant the additional labor of taking these points into consideration, and the answer to this question must, in all cases, be governed by the circumstances.

In the case of the pickers, cards, combers and draw frames, the cost of the overhead, in each case, has been divided by the total pounds produced, without taking into consideration the differences due to the variations in the production and waste of the different stocks. The cost per pound in each case is shown in the table on page 72; the items under "Costs" are obtained from the total column on page 70, while the items under "Pounds Produced" are from the production report shown on page 13.

Cost, per pound, on roving frames:—The overhead on the roving frames is distributed to the different hanks being made, on the piece work cost basis. The slubbers, 1st intermediates, 2nd intermediates and jacks are dealt with separately. On the slubbers the total cost of piece work is 23.21, and the total cost of overhead is 30.45; then 30.45÷23.21 gives the percentage that the cost per pound of overhead on any hank, run on the slubbers, bears to the cost per pound of piece work on that hank.

30.45÷23.21=1.3119, or 131.19%

The cost per pound of piece work for the 60 hank is .000832, then 131.19% of .000832, or .001091, is the cost per pound of the overhead on this hank. The above method is the one adopted in the tables on pages 72 and 74, which show the cost per pound of overhead for each of the different hanks being made.

Summary of overhead in card room:—It is well, at this point, to total the overhead cost per pound in the card room,

2ND INTERMEDIATES

134.45 (overhead cost)÷80.84 (piece work cost)=1.66316 or 166.316%

Hank.	Piece Work Cost, Per Pound.	Per Cent. To Be Taken.	Overhead Cost, Per Pound.
2.6	.001706	166.316%	.002837
3.5	.002318	166.316%	.003855
4.95	.003930	166.316%	.006536
5.25	.004164	166.316%	.006925
6.6	.005362	166.316%	.008918

JACKS

388.46 (overhead cost)÷257.43 (piece work cost)=1.50899, or 150.899%

Hank.	Piece Work Cost, Per Pound.	Per Cent. To Be Taken.	Overhead Cost, Per Pound.
8	.004641	150.899%	.007003
10	.006148	150.899%	.009277
12	.007679	150.899%	.011587
14	.009729	150.899%	.014681
16	.011841	150.899%	.017868
18	.014042	150.899%	.021189
20	.017917	150.899%	.027036
25	.023387	150.899%	.035291

for each separate hank, and use these totals in any later figures, rather than treat each unit in the card room separately. These totals are shown in the table on page 76.

When making the totals for the overhead of the card room, due regard must be given to the organization of the room; that is, in attaching to any particular hank, made on the jack, the cost of overhead for the first intermediates, for instance, it is necessary to know which hank, made on the first intermediates, is going into the final hank roving being dealt with. This information is readily derived from the sheet giving the organization of the card room.

Take the 8 hank roving, for an illustration, and following it through the different units listed in the table, shown on page 76, the first item is the charge against picking. This amount is the same for each of the different hanks being made, consequently there is only one figure that can be used, namely, .002857. The same is true of the carding and drawing.

The 8 hank is not combed work, consequently no charge is made opposite combing, this space being left blank. On the slubbers, two different hank rovings were run, .60 and .70, and the one that is used in later processes for the 8 hank, must be known when making the charge of overhead for slubbers against the 8 hank. Knowing the organization of the room, it is understood that the charge of overhead against the .60 hank, on the slubbers, is the one that goes under 8 hank in the summary sheet. Similarly, on the first intermediates, it is the 1.04 hank that eventually passes into the 8 hank, consequently the charge of overhead against the 1.04 hank, on the first intermediates, or .000931 must be placed under 8 hank on the summary sheet.

On the second intermediates, it is the 2.6 hank that passes to the 8 hank, and the overhead charge for this hank on the second intermediates is .002837, which is the amount under 8 hank, and against second intermediate, on the summary sheet.

Summary of Overhead Costs in Card Room

Unit	CARDED. 8 hk.	CARDED. 10 hk.	COMBED. 10 hk.	COMBED. 12 hk.	COMBED. 14 hk.	COMBED. 16 hk.	COMBED. 18 hk.	COMBED. 20 hk.	COMBED. 25 hk.
Picking	.002857	.002857	.002857	.002857	.002857	.002857	.002857	.002857	.002857
Carding	.007883	.007883	.007883	.007883	.007883	.007883	.007883	.007883	.007883
Combing			.008914	.008914	.008914	.008914	.008914	.008914	.008914
Drawing	.001464	.001464	.001464	.001464	.001464	.001464	.001464	.001464	.001464
Slubbers	.001091	.001091	.001091	.001091	.001091	.001091	.001091	.001091	.001283
1st Int.	.000931	.001625	.001625	.001625	.002081	.002081	.002081	.002081	.002511
2nd Int.	.002837	.003855	.003855	.003855	.006536	.006536	.006925	.006925	.008918
Jacks	.007003	.009277	.009277	.011587	.014681	.017868	.021189	.027036	.035291
Totals	.024066	.028052	.036966	.039276	.045507	.048694	.052404	.058251	.069121

Spinning Room

The overhead in the ring spinning room is split between the warp and filling, and is figured, in both cases, on the spindle basis. The cost for the warp yarn is shown on page 78. The total amount of overhead for warp frames is 700.34 as shown on page 70. The total number of spindles on warp yarn is 35195. Dividing the total amount to be distributed, 700.34, by the total number of spindles, 35195, gives the overhead cost per spindle, or .019899.

If, now, the cost per spindle is multiplied by the number of spindles run on any one count, and this result divided by the pounds of that count turned off, the result will be the cost per pound of that count. This is the method followed in the table. The cost per pound of overhead for the filling is also shown on page 78, the same method being followed as in the case of the warp yarn.

The total amount to be distributed on the filling is 585.87, which, divided by the number of spindles run, 31862, gives .018388 as the cost per spindle to be used.

Warp Preparation Room

Cost, per pound, on spooling:—The overhead cost on spooling is distributed to the different counts run on the productive labor cost basis. The total of the productive labor cost, as shown on the pay roll, is 114.75, which, divided into the amount of overhead to be distributed, 59.13, gives .5153 or 51.53%. That is, the overhead cost per pound, on any one count, is equal to 51.53% of the productive labor cost per pound on that count. This method is followed in the table on page 80 which gives the cost per pound for overhead on each count being run. Take the 35s for an example, the productive labor cost per pound on this count is .0048, then 51.53% of .0048, or .002473 gives the cost per pound of overhead on this count.

Cost, per pound, on twisting:—The overhead on twisting is figured on the spindle basis, and is the same method

Cost, Per Pound, of Overhead on Spinning

Warp Counts.	Spindles.	Cost per Spindle.	Total Cost.	Pounds.	Cost per Pound.
35	2465	.019899	49.051035	2507	.019565
40	496	.019899	9.869904	420	.023499
45	1121	.019899	22.306779	817	.027303
45 H. T.	1330	.019899	26.465670	609	.043457
50	3237	.019899	64.413063	2010	.032046
55	3570	.019899	71.039430	1960	.036244
60	6148	.019899	122.339052	2988	.040943
65 H. T.	926	.019899	18.426474	250	.073706
70	2188	.019899	43.539012	827	.052647
80	5374	.019899	106.937226	1693	.063164
90	4463	.019899	88.809237	1205	.073700
100	444	.019899	8.835156	100	.088351
120	3433	.019899	68.313267	587	.116377
Filling Counts.					
40	131	.018388	2.408828	118	.020413
45	2588	.018388	47.588144	1887	.025219
50	5142	.018388	94.551096	3193	.029612
60	2560	.018388	47.073280	1221	.038553
70	1376	.018388	25.301888	520	.048657
75	3234	.018388	59.466792	1106	.053767
85	1518	.018388	27.912984	437	.063874
90	2330	.018388	42.844040	608	.070467
100	1022	.018388	18.792536	230	.081706
120	1105	.018388	20.318740	190	.106940
120 H.T.	6111	.018388	112.369068	770	.145934
130	4745	.018388	87.251060	688	.126818

as the one employed when distributing the overhead on spinning. The total amount to be distributed is 123.72, which, divided by the spindles run, 4800, gives .025775 as the overhead cost per spindle. The cost per pound on each count is shown in the table on page 80.

Cost, per pound, on warping and slashing:—From the warpers, on through the remainder of the units, the overhead deals with the different styles being run, and not with the yarn counts. The cost per pound of the overhead, on both the warpers and slashers, is dealt with here on the hour basis, since when obtaining the labor cost per pound, the time spent in warping or slashing each style was given.

The total of overhead on warping is 46.49, which divided by the machine hours on warping, 864, gives .053808 as the cost per machine hour of overhead. Multiplying the number of hours spent in warping any one style, by the cost per machine hour, and dividing this result by the number of pounds run on that style, gives the cost per pound for that style. This is the method adopted when obtaining the warping costs shown on page 81, and the slashing costs shown on page 82.

In the case of the slashers, the total of the overhead is 194.68, which, divided by the number of machine hours, 162, gives 1.201728 as the cost per machine hour.

Cost, per pound, on drawing-in:—The total overhead expense, attached to drawing-in, is a very small item and could readily be attached to some other unit when finding the overhead cost of that unit. Dealing with this item in this manner does not, of course, permit of its being separated, but the smallness of the amount hardly justifies making of it a separate account. However, for the purpose of illustration, the overhead on drawing-in will be dealt with in the same manner as the overhead on the other units, and is shown on page 83.

The amount to be distributed is apportioned to the different styles on the labor cost basis. The second column on page 83 shows the labor cost on each style for drawing-in, the third column gives the percentage that the labor cost of each style bears to the total labor cost for this unit. The fourth

Cost, Per Pound, of Overhead on Spooling

Count.	Productive Labor Cost, Per Pound.	Per Cent. Taken.	Overhead Cost, Per Pound.
35	.0048	51.53	.002473
40	.005	51.53	.002576
45	.0054	51.53	.002782
50	.0058	51.53	.002988
55	.006	51.53	.003091
60	.0064	51.53	.003298
65	.007	51.53	.003607
70	.0076	51.53	.003916
80	.009	51.53	.004637
90	.0115	51.53	.005926
100	.015	51.53	.007729
120	.02	51.53	.010306

Cost, Per Pound, of Overhead on Twisting

Warp Counts.	Spindles.	Cost, per Spindle.	Total Cost.	Pounds.	Cost, Per Pound.
40/2	220	.025775	5.670500	412	.013763
65/2	32	.025775	.824800	35	.023565
65/2 H.T.	335	.025775	8.634625	210	.041117
80/2	650	.025775	16.753750	574	.029187
120/2	2475	.025775	63.793125	1185	.053834
Filling Counts.					
40/2	52	.025775	1.340300	115	.011655
120/4 H.T.	1036	.025775	26.702900	753	.035462

Cost, Per Pound, of Overhead on Warping

Style.	Machine Hours.	Cost, per Machine Hour.	Total Cost.	Pounds.	Cost, Per Pound.
A.	67	.053808	3.605136	2456	.001468
B.	66	.053808	3.551328	1254	.002832
C.	17	.053808	.914736	307	.002979
D.	61	.053808	3.282288	450	.007293
E.	13	.053808	.699504	255	.002743
F.	17	.053808	.914736	297	.003080
G.	19	.053808	1.022352	318	.003215
H.	20	.053808	1.076160	342	.003146
J.	11	.053808	.591888	120	.004932
K.	24	.053808	1.291392	414	.003119
L.	23	.053808	1.237584	267	.004635
M.	36	.053808	1.937088	667	.002904
N.	31	.053808	1.668048	371	.004496
P.	37	.053808	1.990896	440	.004524
R.	13	.053808	.699504	218	.003208
F. A.	31	.053808	1.668048	801	.002082
F. B.	37	.053808	1.990896	483	.004122
F. C.	19	.053808	1.022352	335	.003052
F. D.	128	.053808	6.887424	1371	.005023
F. E.	29	.053808	1.560432	806	.001936
F. F.	34	.053808	1.829472	609	.003004
F. G.	74	.053808	3.981792	2015	.001976
F. H.	17	.053808	.914736	356	.002569
F. K.	24	.053808	1.291392	424	.003045
F. M.	16	.053808	.860928	273	.003153

Cost, Per Pound, of Overhead on Slashing

Style.	Machine Hours.	Cost, Per Machine Hour.	Total Cost.	Pounds.	Cost, Per Pound.
A.	14	1.201728	16.824192	2456	.006850
B.	11	1.201728	13.219008	1254	.010541
C.	4	1.201728	4.806912	307	.015657
D.	10	1.201728	12.017280	450	.026705
E.	3	1.201728	3.605184	255	.014138
F.	4	1.201728	4.806912	297	.016185
G.	4	1.201728	4.806912	318	.015116
H.	4	1.201728	4.806912	342	.014055
J.	3	1.201728	3.605184	120	.030043
K.	4	1.201728	4.806912	414	.011610
L.	5	1.201728	6.008640	267	.022504
M.	6	1.201728	7.210368	667	.010810
N.	5	1.201728	6.008640	371	.016195
P.	6	1.201728	7.210368	440	.016387
R.	3	1.201728	3.605184	218	.016537
F. A.	8	1.201728	9.613824	801	.012002
F. B.	7	1.201728	8.412096	483	.017416
F. C.	4	1.201728	4.806912	335	.014349
F. D.	11	1.201728	13.219008	1371	.009642
F. E.	8	1.201728	9.613824	806	.011928
F. F.	10	1.201728	12.017280	609	.019733
F. G.	18	1.201728	21.631104	2015	.010735
F. H.	3	1.201728	3.605184	356	.010127
F. K.	4	1.201728	4.806912	424	.011337
F. M.	3	1.201728	3.605184	273	.013206

Cost, Per Pound, of Overhead on Drawing-in

Style.	Labor Cost.	Per Cent.	Overhead.	Pounds.	Cost, Per Pound.
A.	59.84	16.63	1.243924	2456	.000506
B.	24.61	6.84	.511632	1254	.000408
C.	5.48	1.52	.113696	307	.000370
D.	8.45	2.35	.175780	450	.000390
E.	3.84	1.07	.080036	255	.000313
F.	4.44	1.23	.092004	297	.000309
G.	6.27	1.74	.130152	318	.000409
H.	7.06	1.96	.146608	342	.000428
J.	2.29	.64	.047872	120	.000399
K.	7.87	2.19	.163812	414	.000395
L.	5.64	1.57	.117436	267	.000440
M.	13.08	3.63	.271524	667	.000407
N.	6.72	1.87	.139876	371	.000377
P.	8.43	2.34	.175032	440	.000398
R.	4.26	1.18	.088264	218	.000405
F. A.	12.65	3.52	.263296	801	.000328
F. B.	12.32	3.42	.255816	483	.000529
F. C.	6.29	1.75	.130900	335	.000391
F. D.	54.11	15.03	1.124244	1371	.000820
F. E.	13.11	3.64	.272272	806	.000337
F. F.	11.52	3.20	.239360	609	.000393
F. G.	52.36	14.55	1.088340	2015	.000540
F. H.	10.71	2.98	.222904	356	.000626
F. K.	12.81	3.56	.266288	424	.000628
F. M.	5.74	1.59	.118932	273	.000435

column shows the portion of overhead to be charged to each style and the items in this column are obtained by multiplying the total of the overhead, 7.48, by the percentage set against each style. Dividing the amount of overhead, for each style, by the pounds handled, gives the cost per pound of overhead on each style.

Weave Room

The overhead in the weave room is split between the plain and fancy looms, and in both cases is handled on the loom basis. An explanation for one will constantly serve for both. Knowing the number of looms on each style and the pounds produced, the cost per pound of overhead, on any style, is readily obtained by first dividing the total of overhead, for all the looms being dealt with, by the number of looms run, to find the cost per loom. The cost per loom is then multiplied by the number of looms on any particular style, and the result is divided by the pounds run on that style, which gives the cost per pound for that style. This is the method followed on page 85, which shows the cost per pound on both the plain and fancy styles.

In the case of the plain looms the total amount to be distributed is 789.23, which divided by the number of plain looms, 815, gives .968380 as the overhead cost per loom. On style A there are 125 looms running, which multiplied by the cost per loom, gives a total cost of 121.047500. This amount, divided by the pounds run, 4163, gives .029077 as the cost per pound. In the case of the fancy looms the total of overhead is 907.03, which, divided by the number of looms run, 585, gives 1.550478 as the overhead cost per loom.

Cloth Room

The cost of overhead, in the cloth room, is distributed to the different styles on the yardage basis. The total cost of overhead for this unit, 123.16, is divided by the total yards

Cost, Per Pound, of Overhead on Weaving

Style.	Looms.	Cost, Per Loom.	Total Cost.	Pounds.	Cost, Per Pound.
A.	125	.968380	121.047500	4163	.029077
B.	125	.968380	121.047500	2450	.049407
C.	35	.968380	33.893300	522	.064929
D.	75	.968380	72.628500	759	.095689
E.	25	.968380	24.209500	423	.057233
F.	35	.968380	33.893300	517	.065557
G.	35	.968380	33.893300	530	.063950
H.	35	.968380	33.893300	547	.061962
J.	15	.968380	14.525700	191	.076050
K.	35	.968380	33.893300	596	.056868
L.	30	.968380	29.051400	382	.076050
M.	70	.968380	67.786600	1131	.059935
N.	70	.968380	67.786600	1279	.052999
P.	70	.968380	67.786600	1381	.049085
R.	35	.968380	33.893300	295	.114892
F. A.	75	1.550478	116.285850	1309	.088835
F. B.	70	1.550478	108.533460	823	.131875
F. C.	35	1.550478	54.266730	567	.095708
F. D.	125	1.550478	193.809750	1735	.111705
F. E.	45	1.550478	69.771510	1559	.044754
F. F.	50	1.550478	77.523900	1017	.076227
F. G.	90	1.550478	139.543020	2723	.051246
F. H.	25	1.550478	38.761950	659	.058819
F. K.	35	1.550478	54.266730	632	.085865
F. M.	35	1.550478	54.266730	321	.169055

COST, PER POUND, OF OVERHEAD ON CLOTH ROOM

Style.	Cost Per Yard.	Yards Per Pound.	Cost Per Pound.
A.	.000482	5.00	.002410
B.	.000482	8.50	.004097
C.	.000482	11.75	.005663
D.	.000482	16.46	.007933
E.	.000482	12.30	.005928
F.	.000482	14.10	.006796
G.	.000482	11.00	.005302
H.	.000482	10.66	.005138
J.	.000482	15.36	.007403
K.	.000482	13.06	.006294
L.	.000482	14.52	.006998
M.	.000482	10.31	.004969
N.	.000482	6.75	.003253
P.	.000482	6.75	.003253
R.	.000482	14.63	.007051
F. A.	.000482	10.96	.005282
F. B.	.000482	10.31	.004969
F. C.	.000482	11.82	.005697
F. D.	.000482	9.25	.004458
F. E.	.000482	8.53	.004111
F. F.	.000482	16.59	.007996
F. G.	.000482	11.15	.005374
F. H.	.000482	5.16	.002487
F. K.	.000482	10.75	.005181
F .M.	.000482	14.48	.006979

run, 255567 to find the cost per yard, which gives .000482. This amount, multiplied by the yards per pound on any style, gives the overhead cost per pound on that style. The results, for the different styles are shown on page 86.

OFFICE AND STORAGE

No portion of the expense attached to manufacturing is less tangible than that attached to the office. Just how to apportion the salaries of those connected with the management of a mill, so that each class of goods will bear its just burden, is always a problem, concerning which there is certain to be much difference of opinion. It would seem, however, that those goods, to which there is attached a greater expense throughout the manufacturing processes, which is practically the same thing as saying it takes them longer to pass through the machines, should bear their relative greater burden of the office expense. This method is the one adopted here, and the office expense is distributed on the total labor cost basis, which results in giving to those styles that have a greater labor cost per pound, a proportionate greater part of the office expense. The storage cost may also be included with the office, although if some of the goods warrant having a direct charge made upon them for this branch of the mill, it may be done.

The charge on storage, taken from the overhead sheets, is 17.44 on buildings and 11.02 on land, making a total of 28.46. The overhead on office consists of 20.19 for buildings and 2.31 for land, also a charge of 20.00 for supplies. For the purpose of illustration it will be assumed that the office expenses bring the total for storage and office up to 600.00. These office expenses include salaries, additional insurance not already provided for, freight, interest on loans, (other than cotton, which should be charged directly to the cotton), and may also include the yard help.

The total labor cost amounts to 4829.49, and the amount to be distributed, 600.00, divided by this labor cost, 4829.49,

COST, PER POUND, OF OFFICE AND STORAGE

Style.	Total Labor Cost Per Pound.	Per Cent.	Cost Per Pound.
A.	.083375	12.42	.010355
B.	.125365	12.42	.015570
C.	.153710	12.42	.019090
D.	.239371	12.42	.029729
E.	.135521	12.42	.016831
F.	.149909	12.42	.018618
G.	.153894	12.42	.019113
H.	.153907	12.42	.019115
J.	.204240	12.42	.025366
K.	.148429	12.42	.018434
L.	.186990	12.42	.023224
M.	.147824	12.42	.018359
N.	.113448	12.42	.014090
P.	.111259	12.42	.013818
R.	.185833	12.42	.023080
F. A.	.169063	12.42	.020997
F. B.	.318467	12.42	.039553
F. C.	.192528	12.42	.023912
F. D.	.387610	12.42	.048141
F. E.	.214630	12.42	.026657
F. F.	.300111	12.42	.037273
F. G.	.199500	12.42	.024778
F. H.	.162910	12.42	.020233
F. K.	.239330	12.42	.029724
F. M.	.403622	12.42	.050129

gives .1242 or 12.42%. If, now, 12.42% of the total labor cost per pound on any given style, is obtained, it will show the cost per pound of the office on that style. This is the method adopted on page 88, which shows this expense distributed to the different styles made.

Take style A, for an illustration, the total labor cost per pound on this style has been found to be .083375. 12.42% of .083375 gives .010355 as the cost per pound that must be added to this style, to take care of the office and other general expenses.

SUMMARY OF OVERHEAD COSTS

It is now possible to assemble the overhead costs on the different styles and arrive at the total charge on each. What has been said, however, in connection with the labor cost, applies equally well at this point, that is, that since the cloth embraces both warp and filling, these two materials are handled separately until they are combined in the cloth, when a percentage of the warp cost is taken, and also a percentage of the filling cost. As the method is exactly the same as the one adopted when finding the total labor cost per pound for the different styles, and an explanation was given at that time, it is not deemed necessary to go into this matter further here. The summary of the overhead cost per pound on the different styles is shown on the following pages.

Cost, Per Pound, of Mill Overhead on Warp Yarns, up to Warping

CARDED

Stock.	1⅛	1⅛	1⅛	1¼	1¼E	1¼	1¼	1¼
Hk. roving	8	8	8	10	10	10	12	12
Counts	35	40	40/2	45	45 Hard twist	50	55	60
Card Room	.024066	.024066	.024066	.028052	.036966	.036966	.039276	.039276
Spinning room	.019565	.023499	.023499	.027303	.043457	.032046	.036244	.040943
Spooling	.002473	.002576	.002576	.002782	.002782	.002988	.003091	.003298
Twisting			.013763					
Total	.046104	.050141	.063904	.058137	.083205	.072000	.078611	.083517

Cost, Per Pound, of Mill Overhead on Filling Yarns, up to Weaving

CARDED

Stock.	1⅛	1⅛	1¼	1¼E	1¼	1⅜
Hk. roving	8	8	10	10	12	14
Counts	40	40/2	50	45	60	70
Card room	.024066	.024066	.028052	.036966	.039276	.045507
Spinning room	.020413	.020413	.029612	.025219	.038533	.048657
Twisting		.011655				
Total	.044479	.056134	.057664	.062185	.077809	.094164

1¼E	1¼E	1¼E	1⅜	1⅜	1⅜	1⅜	1½ s.i.	1½ s.i.
14	14	14	14	16	16	18	20	25
65 Hard twist	65/2	65/2 Hard twist	70	80	80/2	90	100	120/2
.045507	.045507	.045507	.045507	.048694	.048694	.052404	.058251	.069121
.073706	.073706	.073706	.052647	.063164	.063164	.073700	.088351	.116377
.003607	.003607	.003607	.003916	.004637	.004637	.005926	.007729	.010306
	.023565	.041117			.029187			.053834
.122820	.146385	.163937	.102070	.116495	.145682	.132030	.154331	.249638

Cost, Per Pound, of Mill Overhead on Filling Yarns, up to Weaving

1⅜	1⅜ s.i.	1⅜ s.i.	1⅜	1½ s.i.	1⅞₆ E	1½ s.i.
16	18	18	20	25	25	25
75	85	90	100	120	120/4 Hard twist	130
.048694	.052404	.052404	.058251	.069121	.069121	.069121
.053767	.063874	.070467	.081706	.106940	.145934	.126818
					.035462	
.102461	.116278	.122871	.139957	.176061	.250517	.195939

Cost, Per Pound, of Mill Overhead on Warp Yarns, in Plain Styles, up to Weaving

Style.	A.	B.	C.	D.	E.	F.	G.
Counts	35	55	60	90	50	60	60
Yarn costs from pages 90 and 91	.046104	.078611	.083517	.132030	.072000	.083517	.083517
Warping	.001468	.002832	.002979	.007293	.002743	.003080	.003215
Slashing	.006850	.010541	.015657	.026705	.014138	.016185	.015116
Drawing- and twisting-in	.000506	.000408	.000370	.000390	.000313	.000309	.000409
Total	.054928	.092392	.102523	.166418	.089194	.103091	.102257

Cost, Per Pound, of Mill Overhead on Warp Yarns, in Fancy Styles, up to Weaving

Style.	F. A.	F. B.		F. C.	F. D.		
Counts	45	80	40/2 Mer.	60	40/2	50	90
Yarn costs from pages 90 and 91	.058137	.116495	.063904	.083517	.063904	.072000	.132030
Warping	.002082	.004122	.004122	.003052	.005023	.005023	.005023
Slashing	.012002	.017416	.017416	.014349	.009642	.009642	.009642
Drawing- and twisting-in	.000328	.000529	.000529	.000391	.000820	.000820	.000820
Total	.072549	.138562	.085971	.101309	.079389	.087485	.147515

H.	J.	K.	L.		M.	N.	P.	R.
60	80	60	100	50	55	70	70	60
.083517	.116495	.083517	.154331	.072000	.078611	.102070	.102070	.083517
.003146	.004932	.003119	.004635	.004635	.002904	.004496	.004524	.003208
.014055	.030043	.011610	.022504	.022504	.010810	.016195	.016387	.016537
.000428	.000399	.000395	.000440	.000440	.000407	.000377	.000398	.000405
.101146	.151869	.098641	.181910	.099579	.092732	.123138	.123379	.103667

F. E.		F. F.		F. G.			F. H.	F. K.	F. M.
65/2 H. T.	45 H. T.	65/2	120/2	80/2	40/2	50	50	60	60
.163937	.083205	.146385	.249638	.145682	.063904	.072000	.072000	.083517	.083517
.001936	.001936	.003004	.003004	.001976	.001976	.001976	.002569	.003045	.003153
.011928	.011928	.019733	.019733	.010735	.010735	.010735	.010127	.011337	.013206
.000337	.000337	.000393	.000393	.000540	.000540	.000540	.000626	.000628	.000435
.178138	.097406	.169515	.272768	.158933	.077155	.085251	.085322	.098527	.100311

Total Overhead Cost, Per Pound, on Plain Styles

Style	A.	B.	C.	D.	E.	F.	G.
Counts warp	35	55	60	90	50	60	60
Counts filling	50	60	85	130	75	75	85
% warp	59	51	59	59	60.2	57.2	60
% filling	41	49	41	41	39.8	42.8	40
Warp cost	.032408	.047120	.060489	.098187	.053695	.058968	.061354
Filling cost	.023642	.038126	.047674	.080335	.040779	.043853	.046511
Weaving	.029077	.049407	.064929	.095689	.057233	.065557	.063950
Cloth room	.002410	.004097	.005663	.007933	.005928	.006796	.005302
Office and storage	.010355	.015570	.019090	.029729	.016831	.018618	.019113
Total	.097892	.154320	.197845	.311873	.174466	.193792	.196230

Total Overhead Cost, Per Pound, on Fancy Styles

Style	F. A.	F. B.		F. C.	F. D.		
Counts warp	45	80	40/2 Mer.	60	40/2	50	90
Counts filling	70	100	40/2 Mer.	75		130	
% warp	61	43	15.8	59	5	32	42
% filling	39	27.3	13.9	41		21	
Warp cost	.044255	.059582	.013583	.059772	.003969	.027995	.061956
Filling cost	.036724	.038208	.007803	.042009		.041147	
Weaving	.088835		.131875	.095708		.111705	
Cloth room	.005282		.004969	.005697		.004458	
Office and storage	.020997		.039553	.023912		.048141	
Total	.196093	.097790	.197783	.227098	.003969	.233446	.061956
		.295573			.299371		

H.	J.	K.	L.		M.	N.	P.	R.
60	80	60	100	50	55	70	70	60
90	120	90		120	75	45	45	
62.5	63	69.5	25.3	44.6	59	29	32	74
37.5	37	30.5		30.1	41	71	68	
.063216	.095677	.068555	.046023	.044412	.054712	.035710	.039481	.076714
.046077	.065143	.037476		.052994	.042009	.044151	.042286	
.061962	.076050	.056868		.076050	.059935	.052999	.049085	.114892
.005138	.007403	.006294		.006998	.004969	.003253	.003253	.007051
.019115	.025366	.018434		.023224	.018359	.014090	.013818	.023080
.195508	.269639	.187627	.046023	.203678	.179984	.150203	.147923	.221737
			.249701					

Pound, on Fancy Styles

F. E.		F. F.		F. G.			F. H.	F. K.	F. M.
65/2 H.T.	45 H.T.	65/2	120/2	80/2	40/2	50	50	60	60
	120/4		50		50		50	90	
13.5	38.25	3.5	56.4	43.6	7.2	23.2	54	67	85
	48.25		40.1		26		46	33	
.024049	.037258	.005933	.153841	.069295	.005555	.019778	.046074	.066013	.085264
	.120874		.023123		.014993		.026525	.040547	
	.044754		.076227		.051246		.058819	.085865	.169055
	.004111		.007996		.005374		.002487	.005181	.006979
	.026657		.037273		.024778		.020233	.029724	.050129
.024049	.233654	.005933	.298460	.069295	.101946	.019778	.154138	.227330	.311427
	.257703		.304393		.191019				

Part III

RAW STOCK COST

The cost per pound of the cotton in the yarn or cloth is not the same as the price per pound paid by the mill, since for each pound of cotton purchased, there will not be turned out a pound of finished product, owing to the waste that is taken from the cotton at the different machines. It is necessary, therefore, when calculating the cost of any product, to first ascertain the actual cost per pound of the cotton in the finished state.

Several items are essential to a correct solution of this problem, and these items may be stated somewhat as follows:

a—The amount of raw stock put into operation during a stated period.

b—Stock in process at beginning of period.

c—Stock in process at end of period.

d—Value of waste sold.

Two other items are also sometimes taken into consideration, namely, the amount of cotton on hand at the beginning of the period and the amount on hand at the end of the period.

In the case of a mill using one class of stock and running it all carded or all combed, it would be necessary, in order to obtain the cost per pound of the cotton as it enters the picker and using items a, b, and c, to add the pounds of stock in process at the beginning of the period, and also its value, to the pounds of stock put into process during the period together with its value. From these results subtract the pounds of cotton in process at the end of the period and also the value. The results obtained are the pounds of cotton to be

charged to production for the period and also the cost. The cost divided by the pounds gives the cost per pound that should be used as the cotton cost at the picker.

If the stock on hand at the beginning of the period is to be taken into consideration, together with the stock on hand at the end of the period, then the equation will be as follows:

(Pounds and value of cotton on hand at beginning of period + pounds and value of cotton in process at beginning of period + pounds and value of cotton purchased during period)—(pounds and value of cotton on hand at end of period + pounds and value of cotton in process at end of the period).=pounds and value to be charged up to production for the period.

Few mills, however, are so fortunate as to be running on one class of work, and in the majority of cases many different kinds of cotton will have to be contended with. When this is the case the different stocks must be reported on separately and the cost per pound found for each. Take the case of the mill being used as an illustration, there are seven different stocks being run, namely, 1⅛, 1¼, 1¼E, 1⅜, 1⅜ s. i., 1⁷⁄₁₆E and 1½ s. i. Moreover, the 1¼ is split, some being carded and some combed. In obtaining the cost per pound in the finished yarn of the above cotton it will be assumed that the different reports show the pounds of each kind opened at the pickers, also the average price of each to be as follows:

Stock.	Pounds.	Average Price.
1⅛	3875	.15
1¼	17791	.17½
1¼ E.	4070	.20
1⅜	8658	.21
1⅜ s.i.	1659	.22
1⁷⁄₁₆E.	1132	.24
1½ s.i.	2488	.26

The waste report is as follows:

Kind.	Value.
Comber	536.90
All other	258.78
Total	795.68

To apportion the value of the waste sold, among all the different kinds of cotton upon the same basis, would manifestly be unfair, since the combed stock loses much more in waste than does the carded stock. It is first necessary therefore to find some equitable basis, on which this value may be distributed. A good method is to find a percentage basis in the following manner:

First place the pounds of carded work produced and the pounds of combed work produced on the same basis, that is find the number of pounds of combed work that would have been produced if it had been run as all carded. This is obtained by dividing the pounds produced by 100% less the per cent. taken out at the combers.

The following table shows the pounds of yarn made from the different combed stocks, also the percentage taken out at the combers:

Stock.	Pounds Yarn Run.	Per Cent. on Combers.
1¼	8346	18
1¼ E	2802	18
1⅜	5696	18
1⅜ s.i.	1066	20
1⁷⁄₁₆ E	785	18
1½ s.i.	1595	20

Take the case of the 1¼ combed, there were 8346 lbs. of yarn made from this stock and 18% waste was taken out at the combers. Had this been carded work, the number of

pounds put into operation would have yielded 8346 ÷ .82 or 10178; that is, if the number of pounds of yarn from the 1¼ combed stock is considered as 10178, and not 8346, it will be on an equal percentage basis with the carded work.

Working out each stock in the above manner gives

1¼	8346 ÷ .82 = 10178	1⅜ s. i.	1066 ÷ .80 = 1333
1¼ E	2802 ÷ .82 = 3417	1⁷⁄₁₆ E	785 ÷ .82 = 957
1⅜	5696 ÷ .82 = 6946	1½ s. i.	1595 ÷ .80 = 1994

These weights may now be used, together with the pounds of yarn made from the carded stock, with which to work out a percentage table that will show the amount to be credited to each stock for waste sold, other than the comber waste. The following table shows the different items worked out in this manner.

The first column indicates the different stocks; the second column shows the number of pounds of each stock there would be in the finished yarn, provided it was all carded; the third column gives the percentage the number of pounds of each stock bears to the total number of pounds; and the last column gives the results obtained by multiplying the amount to be distributed (258.78) by the percentage of each stock.

Value of Waste to be Distributed, 258.78

Stock.	Pounds.	Per Cent.	Value of Waste.
1⅛	3107	9.70	25.10
1¼ carded	4092	12.78	33.07
1¼ combed	10178	31.78	82.24
1¼ E	3417	10.67	27.61
1⅜	6946	21.69	56.13
1⅜ s. i.	1333	4.16	10.77
1⁷⁄₁₆ E	957	2.99	7.74
1½ s. i.	1994	6.23	16.12
Total	32024	100.00	258.78

Using the same numbers for the pounds of the different stocks, another percentage table may be worked out for the combed stock alone. The results are as shown in the following:

VALUE OF COMBER WASTE TO BE DISTRIBUTED, 536.90

Stock.	Pounds.	Per Cent.	Value of Waste.
1¼ combed	10178	41.00	220.13
1¼ E	3417	13.75	73.83
1⅜	6946	28.00	150.33
1⅜ s. i.	1333	5.37	28.83
1 7/16 E	957	3.85	20.67
1½ s. i.	1994	8.03	43.11
Total	24825	100.00	536.90

Adding the value of the comber waste to that of all other waste, on the combed stock, gives the following:

Stock.	1¼ combed	1¼ E	1⅜	1⅜ s. i.	1 7/16 E	1½ s. i.
Comber waste	220.13	73.83	150.33	28.83	20.67	43.11
Other waste	82.24	27.61	56.13	10.77	7.74	16.12
Total	302.37	101.44	206.46	39.60	28.41	59.23

There remains to be determined what proportion of the 1¼ stock that is put into the pickers, belongs to the carded work, and what proportion belongs to the combed work. This may be obtained by using the weight of finished carded work turned out (4092 lbs.) and the weight of finished combed work on the carded basis (10178 lbs.). The sum of these two numbers is 14270, then

14270:4092::17791 (total pounds 1¼ opened):

the pounds going to carded work, or 5101. 17791—5101= 12690 lbs. 1¼ used for combed work.

Assembling the foregoing figures, gives the following data to work with when obtaining the actual cost per pound of the cotton in the finished yarn.

Stock.	Pounds, Opened.	Average Price.	Waste Value.	Pounds Yarn.
1⅛	3875	.15	25.10	3045
1¼ carded	5101	.17½	33.07	4010
1¼ combed	12690	.17½	302.37	8179
1¼ E	4070	.20	101.44	2746
1⅜	8658	.21	206.46	5581
1⅜ s. i.	1659	.22	39.60	1045
1 7/16 E	1132	.24	28.41	770
1½ s. i.	2488	.26	59.23	1565

To find the cost per pound of the cotton in the finished yarn, having the above data, multiply the pounds opened by the average price per pound. From this result subtract the value of the waste sold and divide the remainder by the pounds of yarn spun. The following figures give the cost per pound, in the finished yarn, for each stock being run:

$$\frac{(3875\times.15)-25.10}{3045}=.182623 \text{ cost per lb. of } 1⅛$$

$$\frac{(5101\times.175)-33.07}{4010}=.214365 \text{ cost per lb. of } 1¼ \text{ carded}$$

$$\frac{(12690\times.175)-302.37}{8179}=.234549 \text{ cost per lb. of } 1¼ \text{ combed}$$

$$\frac{(4070\times.20)-101.44}{2746}=.259490 \text{ cost per lb. of } 1¼E$$

$$\frac{(8658\times.21)-206.46}{5581}=.288786 \text{ cost per lb. of } 1\frac{7}{8}$$

$$\frac{(1659\times.22)-39.60}{1045}=.311368 \text{ cost per lb. of } 1\frac{3}{8} \text{ s. i.}$$

$$\frac{(1132\times.24)-28.41}{770}=.315935 \text{ cost per lb. of } 1\frac{7}{16} \text{ E}$$

$$\frac{(2488\times.26)-59.23}{1565}=.375495 \text{ cost per lb. of } 1\frac{1}{2} \text{ s. i.}$$

After the cost per pound of the cotton in the finished yarn has been obtained, it is necessary to attach to each style the cost of the cotton in both the warp and the filling. Since, in practically all of the styles being run, the warp and filling are made from different stocks, the percentage of warp, also of filling, in a pound of cloth must be taken into consideration. Take style A, for an illustration, the count of the warp yarn is 35s which is made from $1\frac{1}{8}$ stock, and in the yarn this stock costs .182623 per lb. The percentage of the cloth made from the warp is 59, then 59% of .182623, or .107747, is the cost of the cotton entering into the warp in one pound of cloth.

Similarly, the count of the filling, in this style, is 50s, which is made from $1\frac{1}{4}$ carded stock, and in the yarn this stock costs .214365 per pound. In one pound of cloth there is 41% of filling, then 41% of .214365, or .087889, is the cost of the cotton entering into the filling in one pound of cloth. .107747 + .087889, or .295636, gives the cost of cotton, in one pound of cloth. This method is followed in the table on pages 104 and 105, which shows the cost of the cotton in one pound of cloth, for each of the styles being run.

Note that style B is the only one in which both the warp and filling are spun from the same stock; the stock, in both cases, being $1\frac{1}{4}$ combed. In such a case it is, of course, not necessary to deal with the percentage, the cost of the cotton

in a pound of cloth being the same as the cost per pound of the cotton in the yarn.

In style R and F. M., both of which call for silk filling, the cost of this portion of the cloth is dealt with for the first time. It is assumed that the 22/26 denier silk, in style R, cost the mill 2.90 per pound, and that the 14/16 denier silk in style F. M. cost 3.35 per pound.

Since the filling, in style R, represents 26% of the weight of the cloth, then 26% of 2.90, or .7540, is the cost of the filling in one pound of the cloth.

In stlye F. M. the filling constitutes 15% of the weight of the cloth, then 15% of 3.35, or .5025 is the cost of the filling in one pound of this cloth.

Cotton Costs on Plain Styles

Style	A.	B.	C.	D.	E.	F.	G.
Counts warp and cotton	1⅛ 35	1¼ 55	1¼ 60	1⅜ 90	1¼ 50	1¼ 60	1¼ 60
Counts filling and cotton	1¼ 50	1¼ 60	1⅜ s. i. 85	1½ s. i. 130	1⅜ 75	1⅜ 75	1⅜ s. i. 85
% warp	59	51	59	59	60.2	57.2	60
% filling	41	49	41	41	39.8	42.8	40
Warp cost	.107747	Warp & filling, same stock.	.138384	.170383	.141198	.134162	.140729
Filling cost	.087889		.127661	.153953	.114937	.123600	.124547
Total	.195636	.234549	.266045	.324336	.256135	.257762	.265276

Cotton Costs on Plain Styles

Style	H.	J.	K.	L.		M.	N.	P.	R.
Counts warp and cotton	1¼ 60	1⅜ 80	1¼ 60	1½ s. i. 100	1¼ 50	1¼ 55	1⅜ 70	1⅜ 70	1¼ 60
Counts filling and cotton	1⅜ s. i. 90	1½ s. i. 120	1⅜ s. i. 90		1½ s. i. 120	1⅜ 75	1¼ E 45	1¼ E 45	22/26 Denier
% warp	62.5	63	69.5	25.3	44.6	59	29	32	74
% filling	37.5	37	30.5		30.1	41	71	68	26
Warp cost	.146593	.181935	.163011	.095000	.104609	.138384	.083748	.092411	.173566
Filling cost	.116763	.138933	.094967		.113024	.118402	.184238	.176453	.7540
Total	.263356	.320868	.257978	.095000	.217633	.256786	.267986	.268864	.927566

.312633

Cotton Costs on Fancy Styles

Style	F. A.	F. B.		F. C.	F. D.		
Counts warp and cotton	1¼ 45	1⅜ 80	1⅛ 40/2 Mer.	1¼ 60	1⅛ 40/2	1¼ 50	1⅜ 90
Counts filling and cotton	1⅜ 70	1⅜ 100	1⅛ 40/2 Mer.	1⅜ 75		1½ s. i. 130	
% warp	61	43	15.8	59	5	32	42
% filling	39	27.3	13.9	41		21	
Warp cost	.130762	.124178	.028854	.138384	.009131	.075055	.121290
Filling cost	.112626	.078838	.025384	.118402		.078854	
Total	.243388	.203016	.054238	.256786	.009131	.153909	.121290

.257254 .284330

Cotton Costs on Fancy Styles

F. E.		F. F.		F. G.			F. H.	F. K.	F. M.
1¼ E 65/2 H.T.	1¼ E 45 H.T. 1⅞₁₆ E 120/4	1¼ E 65/2	1½ s. i. 120/2 1¼ 50	1⅜ 80/2	1⅛ 40/2 1¼ 50	1¼ 50	1¼ 50 1¼ 50	1¼ 60 1⅜ s. i. 90	1¼ 60 14/16 Denier
13.5	38.25	3.5	56.4	43.6	7.2	23.2	54	67	85
	48.25		40.1		26		46	33	15
.035031	.099255	.009082	.211779	.125910	.013149	.054415	.126656	.157148	.199366
	.152438		.085960		.055735		.098608	.102751	.5025
.035031	.251693	.009082	.297739	.125910	.068884	.054415	.225264	.259899	.701866

.286724 .306821 .249209

Part IV

SUMMARY OF ALL COSTS AND CONCLUSION

Having obtained the cost per pound of labor, fixed charges, and cotton, for each of the different styles being run, it is next necessary to assemble these different costs for each style, in order to obtain the total cost per pound of manufacturing. Knowing the total manufacturing cost per pound, the cost per yard is readily obtained by dividing the total cost per pound, of any style, by the yards per pound of that style.

Take style A, for an illustration, the labor cost per pound on this style is .083375; the cost per pound of overhead is .097892 and the cotton cost per pound is .195636, making a total manufacturing cost of .376903 per lb. This style weighs five yards to the pound, then .376903÷5, or .075381, is the total manufacturing cost per yard on this style.

This is the method followed in the table shown on pages 108 and 109, and which gives the total manufacturing cost per pound, also per yard, for each of the different styles dealt with in this work.

There are several points of more or less importance which have not been dealt with previously, in this work, as it was considered better to postpone them for later pages where they could be considered under one heading. Many of these questions, to be taken up at this time, must be decided individually, according to the conditions which exist in each particular case and, consequently, not much more can be done here than to point them out.

As has previously been stated, no one work can deal with the many different conditions which are met with in cotton mills, and it is the main object of a work of this kind to deal with the fundamental principles and let the reader apply them as may best fit his requirements. The questions that are to be considered in the next few pages, will be taken up under the headings of labor, overhead and cotton, thus dealing with them in the order that was used in previous pages.

Labor

Effect of waste, at comber, on cost per pound at previous processes: When obtaining the labor cost per pound on the pickers, also on the cards, the final pounds turned off on the jacks were taken as the pounds run, although the ratio between the carded and the combed work produced by the jacks does not give the correct ratio at the cards, since the combed work loses much more in waste between these two processes.

To illustrate, suppose the jacks are turning off 12000 lbs. of 1¼ stock, in a given time, and that of this amount 4000 lbs. are carded and 8000 lbs. combed. It will also be assumed, for the purpose of illustration, that the carded and combed work have the same rate of production on the cards, and that the combers are taking out 20%. If, now, the method adopted in previous pages to find the labor cost per pound on the cards is followed, then the cost of labor, which will be taken as 21.00, is divided by the pounds turned off on the jacks, 12000, which gives a labor cost per pound of .00175 for the carded work, and also for the combed work.

This, manifestly, is not correct since the cost is being attached to the pounds turned off at the jacks, and any waste, taken out at the combers, must increase the cost per pound of picking for the combed work.

The correct method to follow is to first place the combed work on the same basis as the carded, as regards pounds run through the cards, by dividing the number of pounds combed by 100% less the per cent taken out at the combers. Using this result for the pounds of combed work, the pay on the cards can be split between the carded and combed work

TOTAL COST, PER POUND, ALSO

STYLE	A.	B.	C.	D.	E.	F.
Cost, per pound, of labor	.083375	.125365	.153710	.239371	.135521	.149909
Cost, per pound, of overhead	.097892	.154320	.197845	.311873	.174466	.193792
Cost, per pound, of cotton	.195636	.234549	.266045	.324336	.256135	.257762
Total cost, per pound	.376903	.514234	.617600	.875580	.566122	.601463
Yards, per pound	5.00	8.50	11.75	16.46	12.30	14.10
Total cost, per yard	.075381	.060498	.052562	.053194	.046026	.042657

TOTAL COST, PER POUND, ALSO

STYLE	F. A.	F. B.	F. C.	F. D.	F. E.	F. F.
Cost, per pound, of labor	.169063	.336287	.192528	.387610	.214630	.300111
Cost, per pound, of overhead	.196093	.295573	.227098	.299371	.257703	.304393
Cost, per pound, of cotton	.243388	.257254	.256786	.284330	.286724	.306821
Total cost, per pound	.608544	.889114	.676412	.971311	.759057	.911325
Yards per pound	10.96	10.31	11.82	9.25	8.53	16.59
Total cost, per yard	.055524	.086238	.057226	.105007	.088987	.054932

PER YARD, ON PLAIN STYLES

G.	H.	J.	K.	L.	M.	N.	P.	R.
.153894	.153907	.204240	.148429	.186990	.147824	.113448	.111259	.185833
.196230	.195508	.269639	.187627	.249701	.179984	.150203	.147923	.221737
.265276	.263356	.320868	.257978	.312633	.256786	.267986	.268864	.927566
.615400	.612771	.794747	.594034	.749324	584594	.531637	.528046	1.335136
11.00	10.66	15.36	13.06	14.52	10.31	6.75	6.75	14.63
.055945	.057483	.051741	.045485	.051606	.056702	.078761	.078229	.091260

PER YARD, ON FANCY STYLES

F. G.	F. H.	F. K.	F. M.
.199500	.162910	.239330	.403622
.191019	.154138	.227330	.311686
.249209	.225264	.259899	.701866
.639728	.542312	.726559	1.417174
11.15	5.16	10.75	14.48
.057375	.105099	.067587	.097871

Total Cost, Per Pound, Also

Style	A.	B.	C.	D.	E.	F.
Cost, per pound, of labor	.083375	.125365	.153710	.239371	.135521	.149909
Cost, per pound, of overhead	.097892	.154320	.197845	.311873	.174466	.193792
Cost, per pound, of cotton	.195636	.234549	.266045	.324336	.256135	.257762
Total cost, per pound	.376903	.514234	.617600	.875580	.566122	.601463
Yards, per pound	5.00	8.50	11.75	16.46	12.30	14.10
Total cost, per yard	.075381	.060498	.052562	.053194	.046026	.042657

Total Cost, Per Pound, Also

Style	F. A.	F. B.	F. C.	F. D.	F. E.	F. F.
Cost, per pound, of labor	.169063	.336287	.192528	.387610	.214630	.300111
Cost, per pound, of overhead	.196093	.295573	.227098	.299371	.257703	.304393
Cost, per pound, of cotton	.243388	.257254	.256786	.284330	.286724	.306821
Total cost, per pound	.608544	.889114	.676412	.971311	.759057	.911325
Yards per pound	10.96	10.31	11.82	9.25	8.53	16.59
Total cost, per yard	.055524	.086238	.057226	.105007	.088987	.054932

Per Yard, on Plain Styles

G.	H.	J.	K.	L.	M.	N.	P.	R.
.153894	.153907	.204240	.148429	.186990	.147824	.113448	.111259	.185833
.196230	.195508	.269639	.187627	.249701	.179984	.150203	.147923	.221737
.265276	.263356	.320868	.257978	.312633	.256786	.267986	.268864	.927566
.615400	.612771	.794747	.594034	.749324	584594	.531637	.528046	1.335136
11.00	10.66	15.36	13.06	14.52	10.31	6.75	6.75	14.63
.055945	.057483	.051741	.045485	.051606	.056702	.078761	.078229	.091260

Per Yard, on Fancy Styles

F. G.	F. H.	F. K.	F. M.
.199500	.162910	.239330	.403622
.191019	.154138	.227330	.311686
.249209	.225264	.259899	.701866
.639728	.542312	.726559	1.417174
11.15	5.16	10.75	14.48
.057375	.105099	.067587	.097871

by proportion, or on a percentage basis, after which the cost per pound is obtained by dividing the labor cost of either the carded or combed work by the number of pounds turned out at the jacks, on that work.

This procedure is as follows, taking the production and pay just given:

8000 (lbs. combed)÷.80 (100%—20%)=10000 lbs.
10000 (lbs. combed)+4000 (lbs. carded)=14000 lbs.
10000÷14000=.7143, or, 71.43%
4000÷14000=.2857, or, 28.57%
71.43% of 21.00 (total labor cost)=15.00, labor cost to be charged to the combed work.
28.57%of 21.00=6.00, labor cost to be charged to the carded work.
15÷8000 (lbs. combed work produced on jacks)=.001875, cost per pound on combed work.
6.00÷4000 (lbs. carded work produced on jacks)=.0015, cost per pound on carded work.

Comparing these figures with .00175, which is the cost per pound obtained by dividing the total of the labor pay by the pounds run, it is found that this figure favors the combed work to the extent of .000125 per pound, while it overcharges the carded work .00025 per pound.

There arises the question, does the difference in the figures justify taking this point into consideration, and the answer to this question will always depend upon the conditions under which the work is being done. The influence of the comber waste on the labor cost per pound at the pickers and cards, was not taken into consideration when finding the labor costs in this work, as it was desired to bring out, on those machines, only the influence that the differences in the rate of production has upon the labor cost per pound of the different stocks.

Under cotton costs, the distinction between the carded and combed work was taken into consideration when splitting the value of the waste sold, other than comber waste.

Effect of waste, in spinning room, on cost per pound in card room: When obtaining the labor cost per pound, in the

card room, the pounds turned out at the jacks were taken as the number of pounds run. This number of pounds, however, does not represent the number of pounds of yarn made, since there is a certain loss in the spinning room, due to the waste. It is not, consequently, accurate to use the pounds produced at the jacks, the accurate method being to use the pounds produced on the spinning frames. To adopt this method, however, would mean combining the two distinct departments of carding and spinning, when finding the labor cost per pound. There are many disadvantages to this method and it is much better to deal with each department separately, as was done when finding the labor cost. There should be, however, some allowance made for the difference between the pounds of roving and the pounds of yarn made from it. A good method to follow is to divide the total labor cost per pound, in the card room, by 100% less the per cent of waste taken out in the spinning room. An illustration will serve to make this point clearer.

Suppose that, after the proper distributions of the labor cost in the card room, it is found that a certain hank roving is costing 3c per pound for labor in this department. This cost is based on the pounds run on the jacks, and is correct for the cost so far as the finished roving is concerned, but if this cost per pound in the card room is added to the cost per pound in the spinning room, in order to obtain the cost per pound of the finished yarn, then the figures are not correct, since the number of pounds of roving does not agree with the number of pounds of yarn made from that roving, the stock having lost a certain amount of waste in the spinning room.

If this waste amounts to 2%, then .03, the labor cost per pound on the roving, is 100%—2%, or 98%, of the carding cost in the finished yarn. Then, .03÷.98, or, .030612 is the cost per pound of carding that should be added to the cost per pound of spinning, when finding the total labor cost per pound on the yarn.

Supplies required when starting a mill:—In taking the cost of the machinery, for the different units, when making the distribution for the overhead charges, the cost of all supplies required to put the machinery into running condition, was added to the cost of the machines themselves. Consequently, the charge for depreciation includes a charge against these supplies. There was, however, a separate charge made for all supplies purchased during the period the mill was run, and the cost of these supplies was distributed to each unit under the heading of supplies. Thus, there is a double charge against this item, which, if possible, should be avoided.

In some cases, only those supplies that have a life equal to that of the machinery are included with the cost of the machinery, while the purchase of other supplies that depreciate more rapidly, such as spools, bobbins, shuttles and so on, and which must be obtained when the mill is started, is considered as a part of the works expense. This method naturally throws an undue burden on the manufacturing cost, as the item of supplies, necessary when starting a mill, is a large one. It has, however, the advantage of allowing the cost of any future supplies, purchased to take the place of those worn out, to be made a direct charge against the unit for which the supplies may be purchased.

Possibly a better method than either of the above is to include with the cost of the machinery, the cost of all supplies which have a life equal to that of the machines, but to set up a separate depreciation account for those supplies that depreciate more rapidly, this account to take care of the purchase of any supplies made to replace supplies worn out.

The term supplies, as above used, does not, of course, include those supplies that are being constantly replenished, such as oil, for instance, and which should always be made a direct charge against the unit for which they are purchased.

Depreciation charge included in overhead: The question of including depreciation, as a part of the overhead, will always be one concerning which there is certain to be considerable difference of opinion. The temptation to disregard

the depreciation account in lean years, and trust to some future time to take care of it, is a strong one.

Mill buildings and their contents, however, do depreciate and many cases could be cited where a disregard of this important point has brought about the need for new capital and re-organization. A policy of charging off, each year, a certain amount for depreciation, strictly adhered to, is the only safe one in the end.

Including the depreciation with the overhead, in the manner adopted in this work, is not, of course, the only method of taking care of this item, but it would seem to be as accurate and convenient as any. Moreover, if depreciation is made a part of the manufacturing cost, it is definitely known at what price each style must be sold in order to cover this item. The amount that should be charged off for depreciation on the buildings and machinery must be left for each one to decide as one's judgment may determine, the main point being that something is so charged.

In this work depreciation has been taken at 2½% for buildings and 4% for machinery, which may be considered a fair allowance under ordinary conditions.

Including interest on investment in overhead: When figuring the overhead, the item of interest on the investment was included; this interest was figured at the rate of six per cent. The object of including this interest with the manufacturing cost is to obtain a final cost figure, on the product, which will return a fair profit on the investment. There may be a question as to the propriety of including a dividend with the manufacturing costs, and yet, it would seem that the money, invested in a manufacturing plant, should be entitled to some respect. It is placed there with the expectation of some fair return, although it is true that this expectation is not always realized.

Again, the end aimed for, in all cost finding, should be considered. If it is to learn what the product can be sold for, in order to return a new dollar for an old one, then interest on investment has no place in the overhead. On the other hand, if the object is to learn the price at which the product

can be sold, and return a fair profit on the investment, then interest on investment rightly belongs in overhead.

The argument may be made that, by including interest in overhead, no means is given by which one may know what portion of the final figure, for cost, is manufacturing, and what portion is profit. This is true, and yet, it is possible to have the advantages of such ignorance outweigh the disadvantages. Many times it is better not to know how much a price can be shaded without injury to anyone except the stockholder.

Raw Stock

Apportioning value of waste: When obtaining the cost per pound of the cotton in the finished product, each stock was credited with its portion of the value of the waste sold, the value of the waste being apportioned, to the different stocks, on a percentage basis, worked out from the number of pounds run on the different stocks. The waste item in a cotton mill, especially in one making combed work, is a large one, and many mills are finding it to their advantage to keep a strict account of the waste made from each one of the different stocks being run. This method is, of course, more accurate than the one adopted in this work, and is preferable when circumstances justify the additional labor in the mill, which such a system entails.

When such a system is in force, the amount to be credited to each stock, for waste sold, is a matter of record and does not require being worked out on a percentage basis.

Effect of different methods of selling cotton, on cost per pound: When obtaining the cost per pound of the cotton, in the finished yarn, no allowance was made for the different methods of selling American and Egyptian cotton, although in some instances it may be deemed advisable to take this point into consideration, when finding the cost of the raw stock.

American cotton is sold by the gross weight, while Egyptian cotton is sold by the net weight, consequently to credit both the American and Egyptian cotton for bagging and hoops sold, in proportion to the number of pounds of each

kind of cotton run, is, manifestly, not accurate. This is another instance where the conditions must be known, before making any decision as to taking the question into consideration.

The reader should not gather the impression, from this work, that the manufacturer is able, at all times, to secure for his product the price he may place upon it. More often the product has to be sold in a buyer's market, not in a seller's market, and the manufacturer is compelled to accept the price offered, or let his machinery stand idle. The chief advantage of an accurate cost system, under such circumstances, is that it enables the mill to determine the fabrics which it can afford to manufacture, and, if there is a choice, to select the one which offers the best return.

The fact that one mill is making a cloth at a certain price does not prove that a second mill can afford to make the same fabric at the same price. It is far better for the second mill to learn definitely what it will cost to make the cloth and then base its quotations on that figure.

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